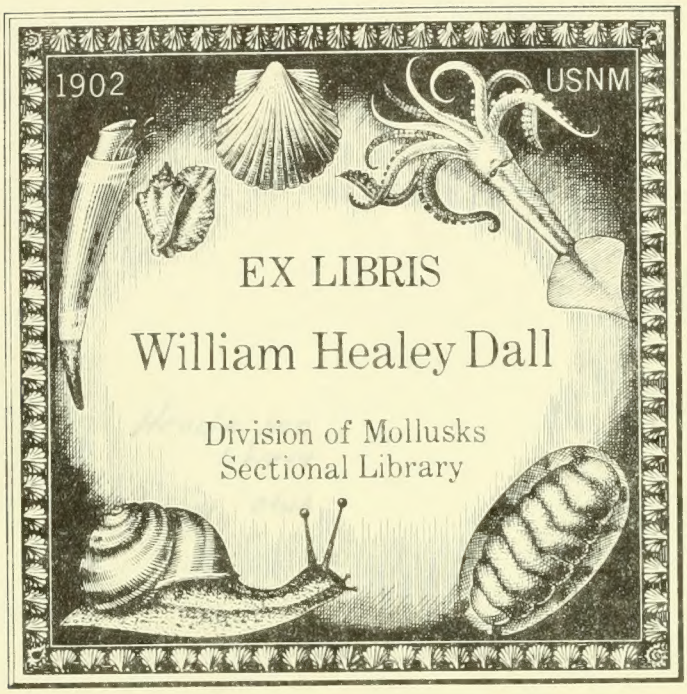

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157

CONCHOLOGIA SYSTEMATICA,

OR

COMPLETE SYSTEM OF CONCHOLOGY:

IN WHICH

THE LEPADES AND CONCHIFEROUS MOLLUSCA

ARE DESCRIBED AND CLASSIFIED

ACCORDING TO THEIR NATURAL ORGANIZATION AND HABITS.

BY LOVELL Augustus REEVE, A.L.S.,

CORRESPONDING MEMBER OF THE LYCEUM OF NATURAL HISTORY OF NEW YORK, ETC.

IN TWO VOLUMES.

VOL. II.

Division of Mollusks
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Concharumque genus parili ratione videmus
Pingere telluris gremium, qua millibus undis
Littoris incurvi bibulam pavit æquor arenam.
LUCRET. ii. 374.

Munere pro tali pulchra te Murice concha
Donabo, ...
. . . . . Est circum vario depicta colore
Naturæ ludentis opus, quam Murice concham
Credo equidem pinxisse manu ingenioque magistro.
PARTHENII ECL. i.

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J. B. BAILLIÈRE, PARIS:—ASHER AND CO., BERLIN:—WILEY AND PUTNAM, NEW YORK.

1842.

PRINTED BY RICHARD AND JOHN E. TAYLOR, RED LION COURT, FLEET STREET.

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MOLLUSCA CONCHIFERA.

Class III. GASTEROPODA.

Animal anticè capitatum; capite plus minusve prominulo, oculis tentaculisque sæpissimè instructo; ore nudo, exsertili, sæpiùs partibus duris armato; pallio amplo, vario, plerumque libero, testam procreante. Branchiæ variæ, rarò symmetricæ, vel per aërem vel per aquam respirantes. Circulatio duplex corde uniloculari, auriculis duabus, valdè remotis, interdum diviso.

Testa calcarea, rarò cornea, sæpissimè spirâ regulari convoluta, plerumque operculo plus minusve clausa; interdum simplex animal obumbrans, nonnunquam laminâ testaceâ sustentata; interdum simplex, parva, pro branchiarum tutamine intrà pallio celata.

In dividing the great series of Mollusca according to the variations of the organ of locomotion, a very considerable majority of them are found to belong to the present class. The Gasteropoda or ventral-moving mollusks, the *Cephala* of Deshayes, the *Paracephalophora* of De Blainville, include all those which acquire motion by the contraction and dilatation of a flat, fleshy, expanded, ventral disc. The greater part of them have a spiral body, inclosed in a spiral shell, and are separated by Lamarck under the title of *Trachelipoda* or neck-moving mollusks; we shall not, however, pursue this arrangement, because the transition from the straight body as in *Limax* to the spiral body as in *Helix*, is too gradual to admit of their being separated. In following out the method of Cuvier, it is curious to observe the changes in the relative distribution of the genera, as compared

74

with the earlier system of Linnæus. We find two genera, for example, *Chiton* and *Patella*, associated together in the same family, the one having a multivalve shell, the other a univalve, yet intimately allied by their natural organization and habits; and, again, we perceive an affinity between two genera, *Haliotis* and *Siliquaria*, whose shells are of the most opposite construction; this apparent anomaly of arrangement, however, will be found to be most simple, and in perfect accordance with the true characters of the animal. Linnæus divided the Mollusca into classes according to the number of pieces of which their shell is composed, *univalve*, *bivalve* or *multivalve*; but, in devising a new and more legitimate arrangement, the great author of the 'Règne Animal' selected those characters which seemed to him to represent the most important features in their natural organization. He first notices the progress of the nervous system, dividing the *cephalous* from the *acephalous*, according to the absence or development of a brain; he then selects the *foot*, or *organ of locomotion*, for the purpose of establishing his classes, and the *branchiæ*, or *organs of respiration*, for dividing these into orders. Now in determining the subdivision of the Gasteropoda after this manner, we are naturally led to suppose that the most simple arrangement would have been to have separated the *hydrobranchiate*, or *water-breathing* kinds, from the *pneumobranchiate*, or *air-breathing*; but so large a proportion would fall into the first of these divisions, that it becomes necessary to examine the system of respiration more minutely: the structure or position of the breathing organs is therefore considered. Upon this plan the Gasteropoda are divided into seven orders: the first have the branchiæ or organs of respiration cirrous or hair-like, whence they are called *Cirrhobranchiata*; the second are remarkable in having them placed in a circle round the body under the edge of the mantle, *Cyclobranchiata*; the third have them situated in a particular cavity in the back of the neck, *Cervicobranchiata*; the fourth are distinguished by having them on the right side only, *Pleurobranchiata*; the fifth have them contained in a lump or nucleus on the back, *Nucleobranchiata*; the sixth have them in the form of a pulmoniferous net-bag, *Pulmobranchiata*; and the seventh have them pectinated, or of the shape of a comb, *Pectinibranchiata*.

NOTICE

AFTER CAREFUL EXAMINATION OF THE INNER MARGIN AND TYPE OF MATERIAL WE HAVE SEWN THIS VOLUME BY HAND SO IT CAN BE MORE EASILY OPENED AND READ.

The shells of the Gasteropoda exhibit a considerable variety of form; sometimes they are small, and attached to different parts of the body, and sometimes they are entirely concealed within the mantle for the protection of the branchiæ; the majority of them, however, are spirivalve. Their progress of growth may be traced with considerable interest: after being ejected either from the parent or from the egg, the animals form an allotted number of volutions in order to complete their shell, which assumes various appearances at different periods of growth; it is curious to observe the true geometrical formation of the spines and varices, as also the frequent operation of absorption; a remarkable economy is also exercised in the repair of accidental fractures. The outer surface of the shell is generally covered with a thick fibrous epidermis, and the inside of it lined with a highly-polished enamel; sometimes, however, when the mantle is expanded entirely over the shell, as in the Olives and Cowries, it is coated with enamel both inside and out. Most of the spirivalve Gasteropoda are furnished with a small accessory appendage attached to the hinder part of the foot for the purpose of shutting themselves within the shell; it has on this account been called the *operculum*, and is either horny or calcareous. Some naturalists attach an undue importance to this organ, adopting its variations as the rules of generic division; but we have observed the opercula of mollusks with considerable attention, and feel assured that their varieties indicate no change of organization in the animal.

The Gasteropoda may be described as having a distinct head situated at the anterior part of the body; it is more or less prominent, and generally provided with eyes and feelers; the mouth is naked and protrudes, and is most frequently furnished with hard parts; the mantle is variable, but generally free, and produces a shell varying considerably in form and structure. The branchiæ, which are seldom symmetrical, are made subservient either to the respiration of air or water. The system of circulation is duplex, performed by an unilocular heart which is divided into two remote auricles.

The shell of the Gasteropoda is either horny or calcareous, generally

univalve, and mostly convoluted into a regular spire, the aperture being in most instances either partially or entirely closed by an operculum; sometimes the shell is simple, entirely covering the animal in the shape of an inverted basin, and, though rarely, supported upon a testaceous basal cup or plate; sometimes, however, it is small and simple, concealed within the animal merely for the protection of the branchiæ.

The Gasteropoda are very numerous, whether terrestrial, fluviatile, or marine, and are divided into seven orders, as follows:

Cirrhobranchiata.	Nucleobranchiata.
Cyclobranchiata.	Pulmobranchiata.
Cervicobranchiata.	Pectinibranchiata.
Pleurobranchiata.	

Order I. GASTEROPODA CIRRHOBRANCHIATA.

Branchiæ cirratæ, cristas duas æquales, pediculo bilobato suprà collum affixas, symmetricè formantes; cristarum filamenta mollia, flexilia, clavæformia.

In this order, recently established by De Blainville, the branchiæ are cirrous, symmetrically divided into two equal tufts of soft flexible club-shaped filaments, attached to a bilobed pedicle on the neck. They are of very peculiar structure, and appear to serve a double purpose,—that of conveying the vital oxygen to the blood, and that of drawing a current of water by their tentacular activity. The following genus is the only one at present known:

Dentalium.

DENTALIUM, Linnæus.

Testa tubulosa, regularis, symmetrica, vel lævis vel laqueata, plus minusve arcuata; latere concavo ventrali, convexo dorsali; versus partem posticam sensim attenuata; extremitatibus perviis, aperturâ anticâ majore, simplici, plerumque obliquâ, posticâ minore; latere dorsali interdum fisso.

The Dentalia were rightly placed by Linnæus with the Mollusca; not, however, from a knowledge of the true characters of their anatomy, but in accordance with his plan of referring to that division all animals dwelling in a tubular testaceous shell. The genus in question was thus associated with others of the most opposite character (*Serpula*, *Teredo*, e. g.), and as the anatomy of the Dentalia was still unknown both to Lamarck and Cuvier, they were removed by these authors with the *Serpulæ* to a place amongst the *Annelides*. Deshayes appears to have been the first to establish the important fact of their being true cirrhobranchiate mollusks, and he describes them as somewhat allied to the *Patellæ*; they are attached to their shell by a distinct muscle, and are furnished with an elongated subcylindrical foot, for the purpose of making their way in the sand.

The shell of Dentalium is described as being tubular, regular, and symmetrical; it is either smooth or fluted, and more or less curved; the concave side being ventral, the convex dorsal; it is also very much attenuated posteriorly, and both ends are open; the anterior aperture, which is the larger, is simple and generally oblique, and the posterior, which is also simple, is sometimes slit on the dorsal side.

The fluted shell of the Dentalia is said to have furnished the design for the shafts of Doric columns.

Examples.

Pl. CXXX. Fig. 1.

DENTALIUM INVERSUM, Deshayes, Monog. du genre Dentale, p. 50. No. 37. pl. 2. f. 21 & 22.

Pl. CXXX. Fig. 2.

DENTALIUM TRANSLUCIDUM, Deshayes, Monog. du genre Dentale, p. 42. No. 21. pl. 2. f. 26.

Pl. CXXX. Fig. 3.

DENTALIUM ENTALIS, Linnæus. Gmelin, p. 3736. No. 4. Lamarck, Anim. sans vert., vol. v. p. 345. Pennant, Zool. Brit., vol. v. pl. 1. f. 2.

Var. *Dentalium Tarentinum*, Lamarck.

Pl. CXXX. Fig. 4.

DENTALIUM DENTALIS, Linnæus. Gmelin, p. 3736. No. 3. Lamarck, Anim. sans vert., vol. v. p. 344.

Pl. CXXX. Fig. 5.

DENTALIUM ELEPHANTINUM, Linnæus. Gmelin, p. 3736. No. 1. Deshayes, Monog. du genre Dentale, p. 27. No. 1. pl. 3. f. 7.

Pl. CXXX. Fig. 6.

DENTALIUM LONGITRORSUM, *Nobis*. Proceedings Zool. Soc., 1842.

Pl. CXXX. Fig. 7.

DENTALIUM APRINUM, Linnæus. Gmelin, p. 3736. No. 2. Lamarck, Anim. sans vert., vol. v. p. 343. Deshayes, Monog. du genre Dentale, p. 31. No. 4. pl. 2. f. 18 & 19.

Var. *Dentalium striatulum*, Linnæus.

Pl. CXXX. Fig. 8.

DENTALIUM OCTOGONUM, Lamarck, Anim. sans vert., vol. v. p. 344. Deshayes, Monog. du genre Dentale, p. 32. No. 5. pl. 2. f. 5 & 6.

Plate CXXX.

Order II. GASTEROPODA CYCLOBRANCHIATA.

Branchiæ subfoliaceæ aut subpyramidatæ, symmetricæ, plus minusve contiguæ, sub margine pallii in serie regulari circumpositæ.

The *Chitones* and *Patellæ* were associated together by Cuvier under the above title, on account of their respiratory organs being placed in a regular circle round the body. This arrangement of the branchial apparatus has, however, been denied by De Blainville with respect to the latter, it being his opinion that it is situated in a cavity at the back of the neck, and that the *Patellæ* therefore belong to the next order, *Cervicobranchiata.* But Cuvier, upon re-examining their anatomy, refuses to admit this opinion, for, after giving it every consideration, he arrives at the following conclusion: "*il m'a eté impossible de le découvrir, ni d'y voir d'autre organe de la respiration que le cordon de feuillets qui règne tout autour sous le rebord du manteau.*" The *Chitones* are altogether dismissed from the Mollusca by the learned author of the 'Manuel de Malacologie;' he associates them with the *Lepades* in a new and particular subkingdom, *Malentozoaria* (Latinè *Molluscarticulata*), under the impression that both are intermediate in their organization between the *Mollusca* and the *Articulata* (*Crustacea*, e. g.). The title of *Cyclobranchiata* is employed by De Blainville in reference to the *Doridæ*, &c. (naked mollusks), but these are the *Nudibranchiata* of Cuvier, and must therefore not be confounded with the present order. Gray appears to have escaped all controversy by including both under the new title of *Gymno-* (Latinè *Nudi-*) *branchiata,* a name which merely denotes that the branchiæ are naked, without particularizing their position; he thus retains the *Doridæ* and *Chitonidæ* in the same order. It is now evident that zoologists are pretty well agreed as to the propriety of Cuvier's arrangement, although some of the animals which are thus associated have a multivalve shell, others an univalve, the very characters that were selected by Linnæus as

the types of his grand primary division of the Mollusca; this only shows the fallacious method to which that author was driven for classifying shells in the absence of their animal inhabitants. The respiratory organs of the cyclobranchiate Gasteropoda may be described as being of a somewhat foliaceous or pyramidal form, symmetrical, more or less continuous, and placed around the body in a regular series under the edge of the mantle. The following three genera are referred to this order:

CHITON.

CHITONELLUS.

PATELLA.

CHITON, Linnæus.

Testa ovalis, regularis, octovalvis; valvæ transversæ, convexæ, in medio subrostratæ, in serie unicâ ordinatæ; superficie aut lævi, aut imbricatâ, aut diversè striatâ; marginibus dorsalibus valvarum incumbentibus, invicem mobilibus; lateribus cute cartilagini aut complanatâ aut coriaceâ aut spinosâ aut hispidâ, validè infixis.

The true characters of the Chitones, so far, at least, as regards their affinity with the *Patellæ*, appear to have been first noticed by Adanson, an intelligent naturalist cotemporary with Linnæus; and it is certainly much to be regretted that the great author of the 'Systema Naturæ' should have been so strongly prejudiced in favour of his arbitrary division of univalves, bivalves, and multivalves, as not to have profited in many instances by the labours of this adventurous traveller in Senegal. Bruguière appears to have followed Linnæus, if we may judge by his arrangement of the figures in the 'Encyclopédie Méthodique;' but the anatomical investigations of Poli, Cuvier and Lamarck have singularly confirmed the anticipations of Adanson, though not without much hesitation on the part of the last-named author. De Blainville, as we have already no-

ticed, still upholds that there is a close affinity between the Chitones and the *Lepades*, considering them as intermediate in their organization between the *Mollusca* and the *Crustacea*; their affinities have, however, been deliberately analysed by Deshayes in his new edition of Lamarck; the anatomical relations of both are carefully set forth, and leave little doubt of the fallacy of this arrangement.

The genus Chiton is one of peculiar interest, because it is the only instance of a mollusk having a multivalve shell; but if the shell be compared with that of *Patella*, their analogy is not so remote as to prevent the expectation of a certain resemblance in their animal inhabitants; the shell of the former offers the same convex surface as that of the latter, and differs only in being divided into eight pieces. The animals of both have the same ventral disc by which they acquire motion; the nature and position of their branchiæ are the same, and they have the same distribution of vessels; the mantle, however, of Chiton is distinguished by its hard, fibrous, cartilaginous composition, necessary to sustain the multivalve construction of the shell.

In one species, the *Chiton amiculatus* (Plates CXXXII. and CXXXIII. Fig. 80.), the mantle is expanded entirely over the shell, and it has on this account been separated by Gray for the formation of a new genus, *Amicula*; this unusual expansion of the mantle, however, is but a peculiar modification of that organ; the valves of the shell are set in the same order and position as in the rest of the Chitons.

The shell of Chiton may be described as being oval, regular, and composed of eight pieces or valves; the valves are transverse, convex, and somewhat beaked in the middle; the surface is either smooth, imbricated, or variously striated, and they are set in a regular series; the dorsal edges of the valves lean one upon the other, moving like plate-armour, and the sides are firmly set in the cartilaginous cuticle of the mantle, which is either smooth or coriaceous, or covered with spines or hair.

The Chitones are very abundant, and may be found at low water upon stones or fragments of rocks, to which they adhere with great power of suction. They have been vulgarly called the Sea Wood-lice, because,

when detached, they contract themselves into a ball like the common wood-louse.

Examples.

Pl. CXXXI. Fig. 1.

CHITON HENNAHII, Gray, Spicilegia Zoologica, p. 5.

Pl. CXXXI. Fig. 2.

CHITON BARNESII, Gray, Spicilegia Zoologica, p. 5.

Pl. CXXXI. Fig. 3.

CHITON STRIATUS, Barnes, American Journ. of Science, vol. vii. n. 1.
Chiton latus, Sowerby.
Chiton olivaceus, Frembly.

Pl. CXXXI. Fig. 4.

CHITON SETIGER, King, Zool. Journ., vol. v. p. 338. Deshayes, new edit. of Lamarck, vol. vii. p. 513.
Var. *Chiton Fremblyi*, Deshayes.
Var. *Chiton raripilosus*, Gray.

Pl. CXXXI. Fig. 5.

CHITON SWAINSONI, Sowerby, Proceedings Zool. Soc., 1832, p. 27. Deshayes, new edit. of Lamarck, vol. vii. p. 496.

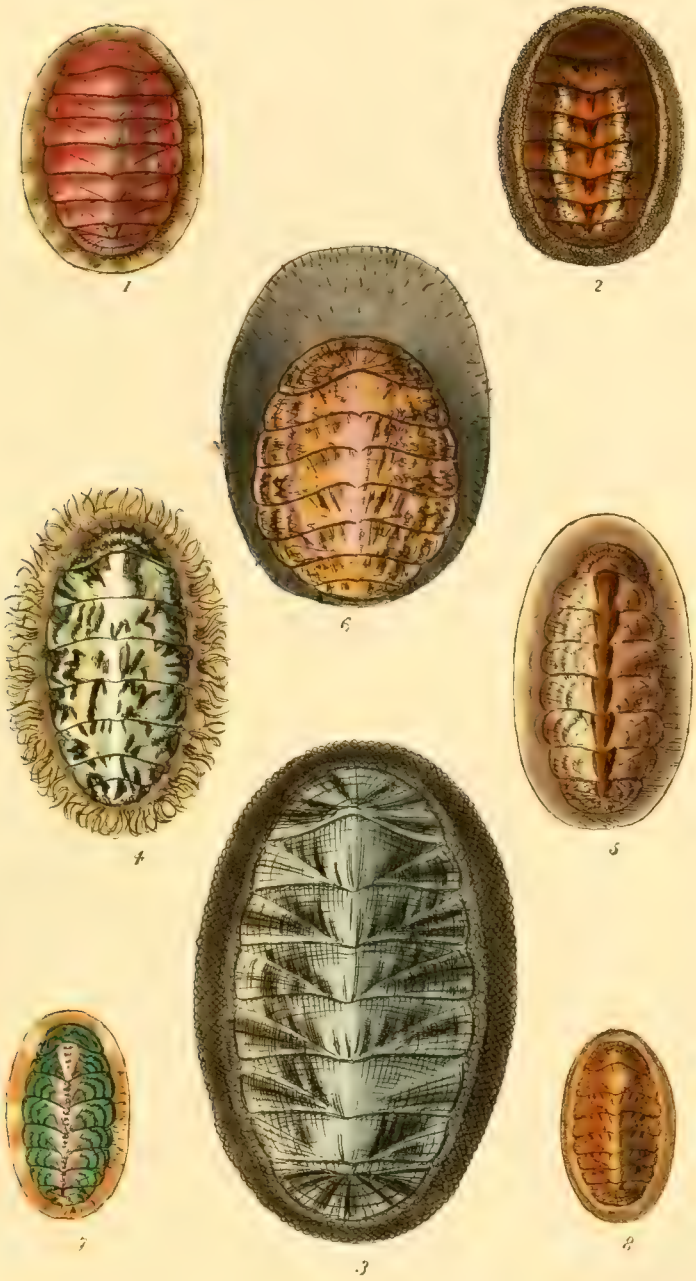
Pl. CXXXI. Fig. 6.

CHITON BLAINVILLII, Broderip, Proceedings Zool. Soc., 1832, p. 27. Deshayes, new edit. of Lamarck, vol. vii. p. 514.

Pl. CXXXI. Fig. 7.

CHITON LYELLI, Sowerby, Proceedings Zool. Soc., 1832, p. 26. Deshayes, new edit. of Lamarck, vol. vii. p. 501.

Plate CXXXI



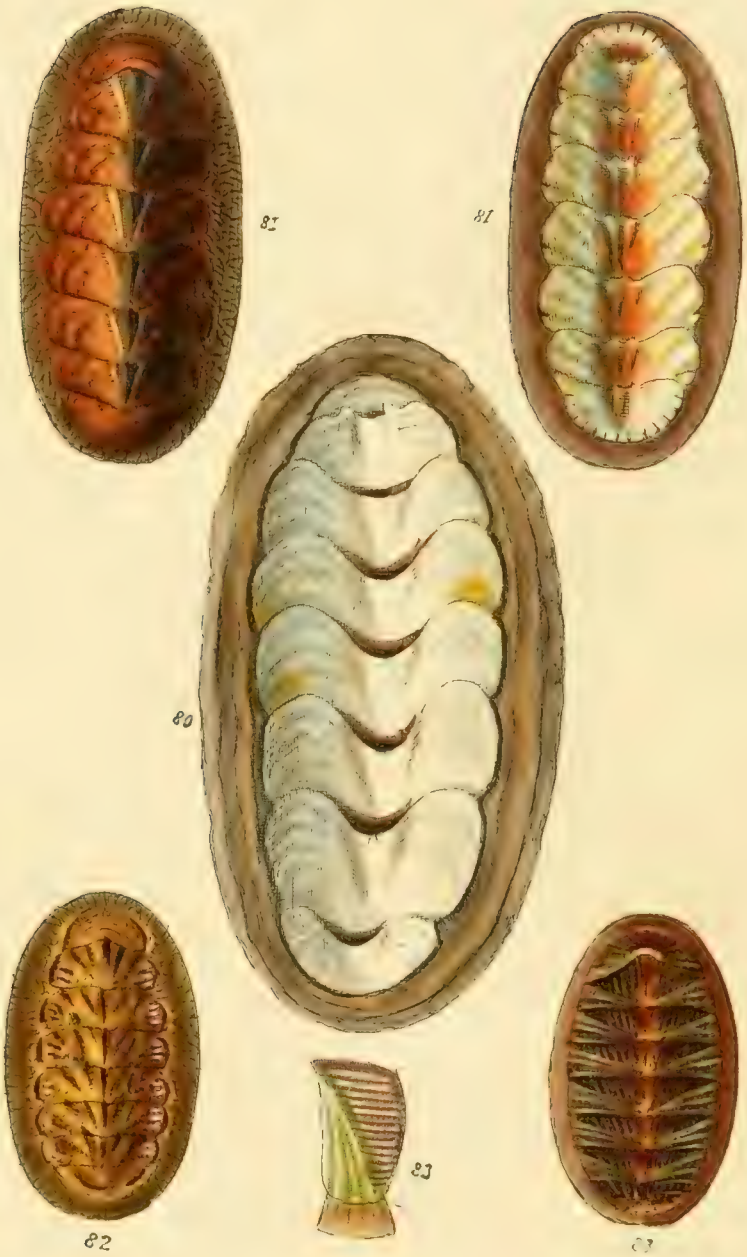

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Plate CXXXIII.

Chilon

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151

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Pl. CXXXI. Fig. 8.

CHITON GRAYI, Sowerby, Proceedings Zool. Soc., 1832, p. 57. Deshayes, new edit. of Lamarck, vol. vii. p. 497.

Pl. CXXXII. and CXXXIII. Fig. 80.

CHITON AMICULATUS, Pallas, Nov. Act. Petrop. ii. p. 241. pl. 7. f. 26–30.
Amicula ————? Gray.

Pl. CXXXII. Fig. 81 and 82.

CHITON WATSONI, Sowerby, Mag. Nat. Hist., June 1840.
Chiton castaneus, Quoy and Gaimard. Deshayes.

Pl. CXXXII. Fig. 83.

CHITON FULVUS, Wood, Gen. Conch., pl. 1. f. 2.

Pl. CXXXIII. Fig. 85 and 86.

CHITON CYMBIOLA, Sowerby, Mag. Nat. Hist., June 1840.
Chiton tulipa, Quoy and Gaimard.

Pl. CXXXIV. Fig. 147.

CHITON PICEUS, Gmelin. Linn. Syst. Nat., p. 3204. Wood, Gen. Conch. pl. 1. f. 3.

Chiton convexus,
Chiton granulatus,
Chiton gemmatus,
Chiton tuberculatus,
Chiton unguiculatus,
Chiton zonatus, } Auctorum.

Pl. CXXXIV. Fig. 148.

CHITON MARMORATUS, Gmelin. Linn. Syst. Nat., p. 3205.

Pl. CXXXIV. Fig. 151.

CHITON SPINOSUS, Bruguière, Journ. d'Hist. Nat., vol. i. p. 25. pl. 2. f. 1 and 2. Sowerby, Genera of Shells, fig. 1.

Pl. CXXXIV. Fig. 152.

CHITON TUNICATUS, Wood, Gen. Conch., pl. 2. f. 1.

Pl. CXXXIV. Fig. 154.

CHITON CHILENSIS, Frembly, Zool. Journ., vol. iii. p. 203. pl. 17. f. 6. Deshayes, new edit. of Lamarck, vol. vii. p. 493.

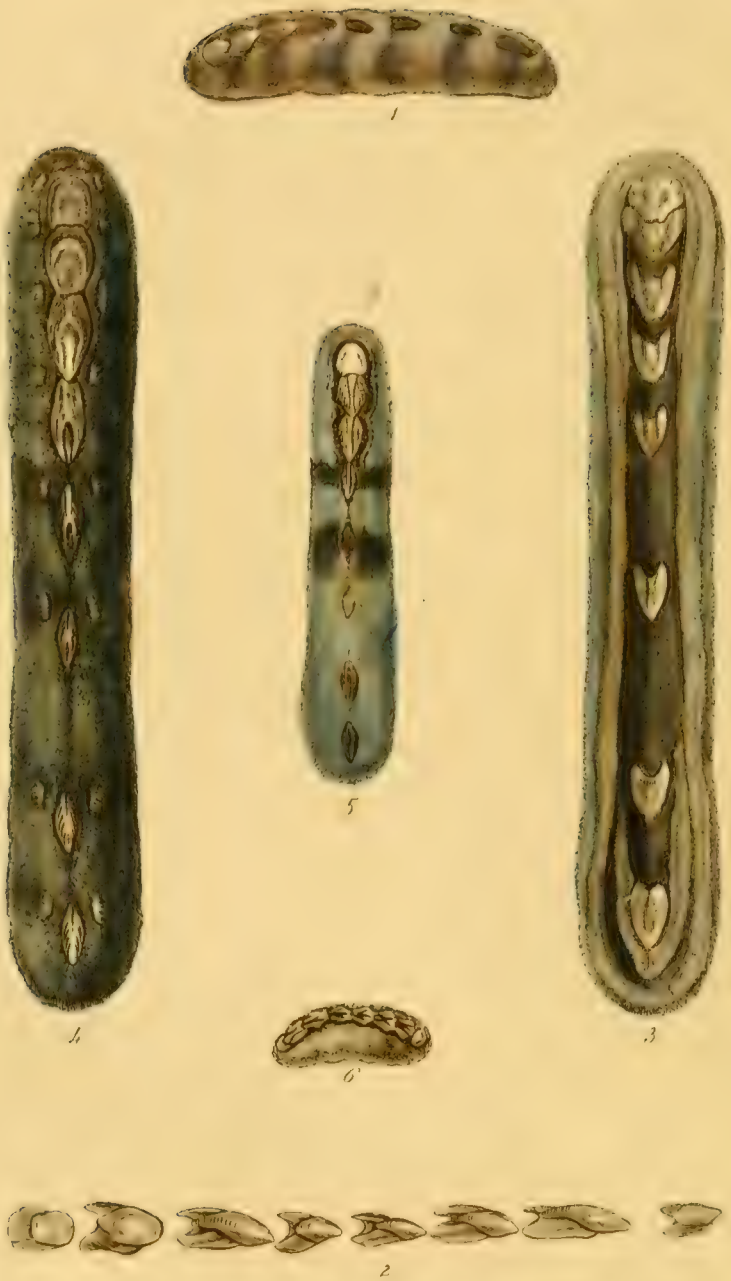
CHITONELLUS, Lamarck.

Corpus repens, erucæforme, valvis octo testaceis instructum ; valvæ longitudinales, sejunctæ, per medium pallii externè sepositæ, versùs extremitatem anticam appropinquantes, in cute crassâ, plerumque coriaceâ, profundè insertæ.

The Chitonelli were separated from the *Chitones* by Lamarck ; and it is not without some consideration that we differ from such authority as that of De Blainville, Sowerby and Deshayes as to the propriety of reuniting them. We cannot attach any material value to the difference in the size and shape of their shells, but the change in the position and arrangement of the valves is curious and important. In the *Chitones* they are firmly set in a strong marginal cartilage, fitting and moving upon each other like plate-armour with the motion of the animal ; and although the *Chiton amiculatus* has its shell entirely concealed within the mantle, still the order and disposition of the pieces is the same. In the Chitonelli, on the contrary, the valves do not so much as touch each other, nor are they set in the same cartilaginous frame, but inserted or unconnectedly dotted, as it were, down the middle of the mantle. In some specimens of the

CHITONELLUS.

Plate CXXXV.



G. B. S. Inv.

Chiton fasciatus (Plate CXXXV. Fig. 3, 4 and 5), recently brought from the Philippine Islands by Mr. Cuming, the mantle is of enormous size in proportion to the body of the animal; the valves of the shell are distant from each other, and the species altogether is highly characteristic.

The Chitonellus may be described as being elongate, worm-shaped, and furnished with eight testaceous valves; the valves are longitudinal, disjoined, and inserted, independent of each other, along the back of the mantle; they approximate towards the anterior end, and are deeply imbedded within the substance of the skin, which is thick and generally coriaceous, often sparkling, when dried, like congealed frost.

Examples.

Pl. CXXXV. Fig. 1.

CHITONELLUS STRIATUS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 481.
Chiton striatus, Sowerby.

Pl. CXXXV. Fig. 2.

CHITONELLUS LÆVIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 481. De Blainville, Manuel de Malacologie, pl. 87. f. 5.
Chiton erucæformis, Sowerby.

Pl. CXXXV. Fig. 3, 4 and 5.

CHITONELLUS FASCIATUS, Quoy and Gaimard, Voyage de l'Astrolabe, vol. iii. p. 408. pl. 73. f. 21 to 29. Deshayes, new edit. of Lamarck, vol. vii. p. 482.
Chiton fasciatus, Sowerby.

Pl. CXXXV. Fig. 6

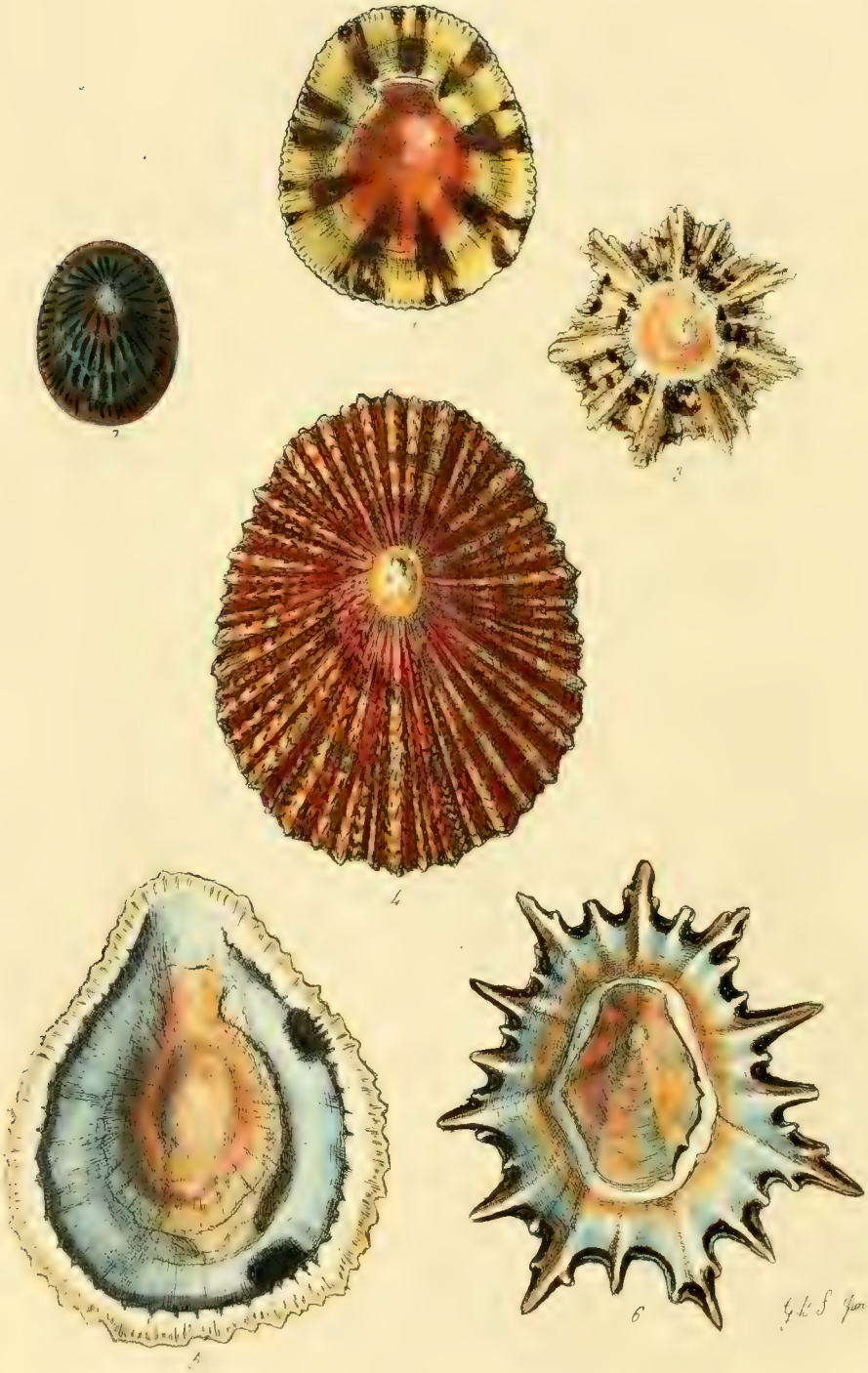
CHITONELLUS STRIGATUS, *Nobis.*
Chiton strigatus, Sowerby, Mag. Nat. Hist., June 1840.

PATELLA, Auctorum.

Testa elliptica, univalvis, non spiralis, patellæformis aut clypeiformis, depresso-conica, subtùs concava; margine basali sæpè crenato; vertice plerumque subcentrali, anticè recurvo. Impressio muscularis elliptica, anticè interrupta.

The title of *Lepas*, which is now used in reference to the preceding sub-kingdom of Invertebrata, appears to have been originally appropriated to the animals vulgarly called *Limpets*. Whether the ancient Greeks derived this appellation from the word λεπὰς, *a rock*, as expressive of their living attached to rocks, or from λεπὶς, *a scale*, or *the rind of anything*, in allusion to the manner in which the rocks become coated with them, it is unimportant to determine. The Latins distinguished the *Limpets* by the appropriate title of Patella, the name of a small deep dish used for carrying meat in their sacrifices; hence it is that, in the works of the early naturalists, we find the two names Patella and *Lepas* recorded as synonyms. The genus Patella was thus adopted by Linnæus to include all mollusks having a patellæform or dish-shaped shell; and as the variations in their organization and habits have subsequently become known, it has been distributed into the following genera: *Fissurella, Emarginula, Calyptræa, Crepidula, Pileopsis, Hipponyx, Parmophorus, Umbrella, Siphonaria, Lottia, Ancylus* and *Navicella*; and even these again have been still further subdivided by some authors.

The shell of Patella may be described as being elliptic, univalve, not spiral, basin- or dish-shaped, of the form of a shield or depressed cone, and always concave beneath; the basal margin is often crenated all round; the vertex or summit of the shell is mostly situated near the centre, and always recurved anteriorly, that is, towards the head of the animal. The muscular impression in the interior is elliptic, and interrupted in the same direction.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The Patellæ, in common with most of the Mollusca, are supplied with a powerful solvent secretion, by the aid of which they make, as it were, a socket in their place of attachment; and after crawling away in search of food, they have been observed to return to their original resting-place. Their shells vary considerably in growth; they however pass so completely by modification the one into the other, that it is difficult to determine the species.

Examples.

Pl. CXXXVI. Fig. 1.

PATELLA VARIEGATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CXXXVI. Fig. 2.

PATELLA PELLUCIDA, Linnæus, Syst. Nat., p. 1260.
Helcion ——— ? De Montford.

Pl. CXXXVI. Fig. 3.

PATELLA STELLÆFORMIS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CXXXVI. Fig. 4.

PATELLA MINIATA, Born. Mus., p. 420. Lamarck, Anim. sans vert., new edit., vol. vii. p. 538. Sowerby, Genera of Shells, Fig. 2.
Patella umbella (*var.*), Deshayes.

Pl. CXXXVI. Fig. 5.

PATELLA COCHLEAR, Born. Mus., vol. xviii. f. 3. De Blainville, Manuel de Malacologie, pl. 49. f. 4.

Pl. CXXXVI. Fig. 6.

PATELLA LONGICOSTA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 528. Deshayes, Enc. Méth. vers, vol. iii. p. 711.

Order III. GASTEROPODA CERVICOBRANCHIATA.

Branchiæ pectinatæ, propè ad collum plerumque in cavitate speciali impositæ; pallio suprà cavitatem interdum fisso.

The Cervicobranchiate Gasteropoda are so called, because the respiratory organs are situated at the back of the neck, in an oblique line either upon the surface or in a particular cavity. Some authors have instituted a still further subdivision of these organs; Deshayes, for example, distinguishes the *Scutibranchiate*, the *Tubulibranchiate* and the *Aristerobranchiate*. Gray, on the other hand, refuses to accept the arrangement or position of the branchiæ as typical; in consequence of their pectinate structure, he includes the whole of these mollusks with the great mass of *Pectinibranchiata*, changing the title to *Cteno-* (Latinè *Pectini-*) *branchiata*.

The breathing apparatus of the Cervicobranchiata undoubtedly passes through a considerable variety of modification, and their shells are of very anomalous construction. Those of the *Siliquariæ* and *Haliotides*, for instance, differ materially in their growth, notwithstanding the affinity of their animal inhabitants; there is an analogy between these two genera which could not have been anticipated until the nature and position of the breathing organs became known. The respiration of each requires a continual current of water; and not only is the mantle slit or perforated in that part which covers the cervical cavity, but the shell also; so that the important consideration of the branchiæ has detected an affinity between two mollusks which had been previously assigned to different parts of the system.

We divide this order into four families, as follows:

Fissuracea.	Macrostomata.
Capulacea.	Tubispiracea.

Family 1. FISSURACEA.

Testa patellæformis, animal sæpissimè obumbrans, aut perforata, aut emarginata, aut impressione siphonali internè imbuta.

This family, which we have ventured to introduce under the above new title, includes that portion of the Cervicobranchiate Gasteropoda whose shell exhibits the channel by which the water is communicated to the branchial cavity, either by an internal siphonal impression, by a marginal sinus, or by a complete perforation or fissure. They were included by Lamarck with "*Les Calyptraciens*," but the necessity of dividing that family has been successfully determined both by De Blainville and Gray; by the former they are assigned to different orders; by the latter, to different sections of the same order. The distinguishing character of the Fissuracea, namely, the perforation, fissure, or siphonal impression, is certainly indistinct, if at all visible, in the shell of *Lottia*; but as the structure and arrangement of the breathing apparatus is known to be the same, we have regarded the *Lottiæ* as being intermediate between the *Patellæ* and the *Siphonariæ*.

The family of the Fissuracea includes the five following genera:

LOTTIA.	EMARGINULA.
SIPHONARIA.	FISSURELLA.
PARMOPHORUS.	

LOTTIA, Gray.

Testa patellæformis, regularis, plerumque depressiuscula, vertice antico, propè ad marginem incumbente, nonnunquam ferè marginali. Im-

pressio muscularis non symmetrica, anticâ parte ad dextram latiore; disco centrali interno plerumque fusco-vario.

This genus was first proposed by the indefatigable naturalists of the ship 'Astrolabe,' MM. Quoy and Gaimard, under the name of *Patelloida*; but as this is properly a specific and not a generic appellation, we have been compelled to follow the less significant and unmeaning title of Lottia. It is not surprising that the Lottiæ should have been confounded with the *Patellæ*, as they scarcely differ from them except in the arrangement of the branchiæ; which, instead of being disposed in symmetrical order round the body, were discovered by those zealous malacologists to be situated in a particular cavity at the back of the neck, as in the *Fissurellæ*. In other respects the internal organization of the Lottiæ and *Patellæ* is nearly the same, and their shells are hardly distinguishable from each other; as a general character we may, however, notice, that in those of the present genus the vertex is much more nearly approximated to the anterior margin.

The shell of Lottia may be described as being patellæform or dish-shaped, regular, and generally rather depressed; the vertex is anterior, and approximates to the margin; in some few instances it is quite marginal. The muscular impression is not symmetrical, the anterior part of it being generally rather wider on the right side; and it has been remarked that the internal central disc is generally of a dark or varied colour.

Examples.

Pl. CXXXVII. Fig. 1.

Lottia gigantea, Gray. Sowerby, Genera of Shells, No. 42.

Pl. CXXXVII. Fig. 2.

Lottia testudinaria, Sowerby, Genera of Shells, No. 42.
Patella testudinaria, Linnæus.

Pl. CXXXVII. Fig. 3.

Lottia radians, Sowerby, Genera of Shells, No. 42.

Plate CXXXVII.

1 *Lottia gigantea.*
2 *" testudinaria.*
3 *Lottia radians*
4 *" Antillarum*

Pl. CXXXVII. Fig. 4.

LOTTIA ANTILLARUM, Sowerby, Genera of Shells, No. 42.

SIPHONARIA, Sowerby.

Testa orbiculata, patellæformis, depresso-conica, non symmetrica, margine basali plerumque crenata; vertice sub-obliquo, posticè recurvo. Impressio muscularis anticè interrupta, latere dextro canali profundè imbuta.

In the course of our observations on this class, we have mentioned that the whole of the Linnæan *Patellæ* were associated by early naturalists under the title of *Lepas*; one species, however, the *Patella sipho*, appears to have been distinguished by Adanson, in his account of the mollusks of Senegal, by the appellation of *Le Mouret*. The peculiarity of the siphonal impression in the interior of the shell, which excited the attention of this acute naturalist, undoubtedly suggested to him the indication of a change in the organization of the animal, and by the result of subsequent discoveries his anticipation has been singularly verified. The breathing organs of the Siphonariæ differ from those of the *Patellæ* in being situated within a cavity at the back of the neck, and the canal or siphon is formed by the passage of the water for the purposes of respiration. This important generic character was for some time overlooked; it escaped the notice of both Cuvier and Lamarck; to Sowerby we are indebted for the introduction of the genus Siphonaria, and to De Blainville and Quoy for the anatomical detail of the animal.

With regard to the situation that the Siphonariæ should occupy in the natural system, authors are much divided; De Blainville associates them with the *Umbrellæ* in a particular family of his *Monopleurobranchiata* (*Patelloidea*). In the present arrangement we have considered them as being intermediate between the simple and the fissurated Limpets, to which they are allied by the *Lottiæ* on one side, and the *Parmophori* on the other.

They are, however, very differently disposed of by Gray; the Siphonariæ are regarded by this author as being pulmoniferous; he asserts, that although inhabiting the sea, they are compelled to rise to the surface of the water in order to breathe air, like the freshwater *Ancyli*; and they are consequently placed by him in his order *Pneumonobranchiata*, in company with the *Lymnææ*, *Helices*, *Cyclostomata*, and the rest of the air-breathing *Gasteropoda*; the truth of this hypothesis however remains to be determined.

The shell of Siphonaria may be described as being orbicular, dish-shaped, or of the form of a depressed cone, and generally crenated at the basal margin; the vertex is somewhat oblique, and recurved backwards. The muscular impression is interrupted anteriorly, and the right side of it is characterized by the appearance of a canal or siphon.

Examples.

Pl. CXXXVIII. Fig. 1.

Siphonaria atra, Quoy and Gaimard, Voy. de l'Astrolabe, vol. ii. p. 337. pl. 25. f. 41 and 42. Deshayes, new edit. of Lamarck, vol. vii. p. 560. *Siphonaria picta*? D'Orbigny.

Pl. CXXXVIII. Fig. 2.

Siphonaria denticulata, Quoy and Gaimard, Voy. de l'Astrolabe, vol. ii. p. 340. pl. 25. f. 19 and 20. Deshayes, new edit. of Lamarck, vol. vii. p. 559.

Pl. CXXXVIII. Fig. 3.

Siphonaria characteristica, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CXXXVIII. Fig. 4 and 5.

Siphonaria obliquata, Sowerby, Appendix to Tankerville Catalogue.

Pl. CXXXVIII. Fig. 6.

Siphonaria gigas, Sowerby, Appendix to Tankerville Catalogue.

Plate CXXXVIII.

G.B. Sowerby fil.

Plate CXXXIX.

G. B. Sowerby, Jun.

PARMOPHORUS, De Blainville.

Testa oblonga, depressa, clypeiformis, supernè convexiuscula, extremitate anticâ sinu parvulo emarginatâ; vertice minimo, posticè inflexo. Impressio muscularis canali ad sinum decurrente.

The peculiar flatness which characterizes the shell of the *Patella ambigua* of Chemnitz induced De Montford to select it as the type of a new genus, which he distinguished by the title of *Scuta*. This appellation was, however, changed by De Blainville to that of Parmophorus, and as he was the first to discover the true cervicobranchiate nature of the animal, it has been generally adopted. Both Sowerby and Deshayes refuse to sanction this genus; they consider that the Parmophori are too closely allied to the *Emarginulæ* to admit of their being separated; we must, however, remember that, although the animals of the two genera are comparatively alike, the typical species of each have very differently formed shells. In the Parmophori the shell is nearly flat, and merely indented at the edge with a kind of sinus; whilst in the *Emarginulæ* the type is very deeply conical, and exhibits a distinct longitudinal slit or fissure.

The shell of Parmophorus may be described as being oblong, depressed, rather convex, shaped like a shield, and emarginated on the anterior side; the vertex, which is very small, is bent backwards. The muscular impression is interrupted anteriorly, and exhibits the mark of a canal running to the marginal sinus.

Examples.

Pl. CXXXIX. Fig. 1.

Parmophorus corrugatus, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CXXXIX. Fig. 2 and 3.

Parmophorus australis, Lamarck, Anim. sans vert., old edit., vol. vi. 2nd part, p. 5.

Patella ambigua, Chemnitz.
Scuta antipodes, De Montford.
Parmophorus elongatus, De Blainville.
Emarginula elongata, Sowerby.

Pl. CXXXIX. Fig. 4.

PARMOPHORUS GRANULATUS, De Blainville, Bulletin des Sciences, 1817. Lamarck, Anim. sans vert., new edit., vol. vii. p. 579.

Pl. CXXXIX. Fig. 5 and 6.

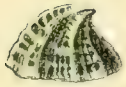
PARMOPHORUS INTERMEDIUS, *Nobis*, Proceedings Zool. Soc., 1842.

EMARGINULA, Lamarck.

Testa parva, vel conica, vel depresso-conica, extùs plerumque radiata, radiis a vertice ad marginem decurrentibus; margine sæpissimè crenulato, anticè fissurâ aut sinu emarginato; fissurâ interdum altiori, propè ad verticem perforatâ; vertice posticè subrecurvo.

Another of the Linnæan Patellæ, *Patella fissura*, was selected by Lamarck as a type for the formation of this genus; the slit or fissure in the anterior margin of the shell being considered by him as entitled to a generic distinction. It may be noted from our observations on this family, that the *Fissuracea* are for the most part divided into genera according to the change in the position of the branchial cavity. In the *Siphonariæ*, for example, the communication of the water with the branchiæ is from the right side, and their shells exhibit a corresponding lateral siphonal impression; in the *Fissurellæ* it is from the top, and their shells are therefore perforated at the vertex; in the *Parmophori* it is from the anterior side above the head, and their shells accordingly exhibit an anterior siphonal impression. Now in the Emarginulæ the position of

Plate CXL.



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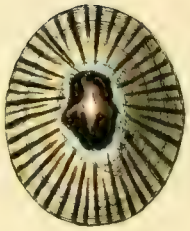

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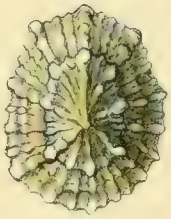

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the breathing apparatus varies between that in the *Fissurellæ* and that in the *Parmophori*; their shells are therefore sinuated or perforated sometimes at the anterior margin, sometimes higher up in the bend of the shell. The latter division of *Emarginulæ* has been set apart by Defrance under the new title of *Rimula*, changed, we believe, by Gray to that of *Diodora*; this variation, however, is unimportant.

The shell of Emarginula may be described as being small, shaped either like a cone, or very depressed patellæform cone; it is generally radiated on the outside, the rays diverging, as in most cases, from the vertex to the basal margin; the margin is generally crenulated, and emarginated anteriorly with a small sinus or fissure; the fissure in some instances approaches to the vertex, which is somewhat recurved in a posterior direction.

Examples.

Pl. CXL. Fig. 1.

EMARGINULA PANHIENSIS, Quoy, Voy. de l'Astrolabe, Pl. 68. f. 7 and 8.

Pl. CXL. Fig. 2.

EMARGINULA CANCELLATA, Philippi, Moll. Siciliæ, pl. 7. f. 15.
Patella crystallina, Wood.

Pl. CXL. Fig. 3.

EMARGINULA NOTATA, Sowerby MSS.
Patella notata, Linnæus. Chemnitz, Conch., vol. x. p. 324. Vign. 25. f. C, D.

Pl. CXL. Fig. 4.

EMARGINULA EMARGINATA, De Blainville, Manuel de Malac., pl. 48. f. 2.

Pl. CXL. Fig. 5 and 6.

EMARGINULA TRICOSTATA, Sowerby, Genera of Shells, No. 34. f. 6.

Pl. CXL. Fig. 7.

EMARGINULA CONOIDEA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CXL. Fig. 8.

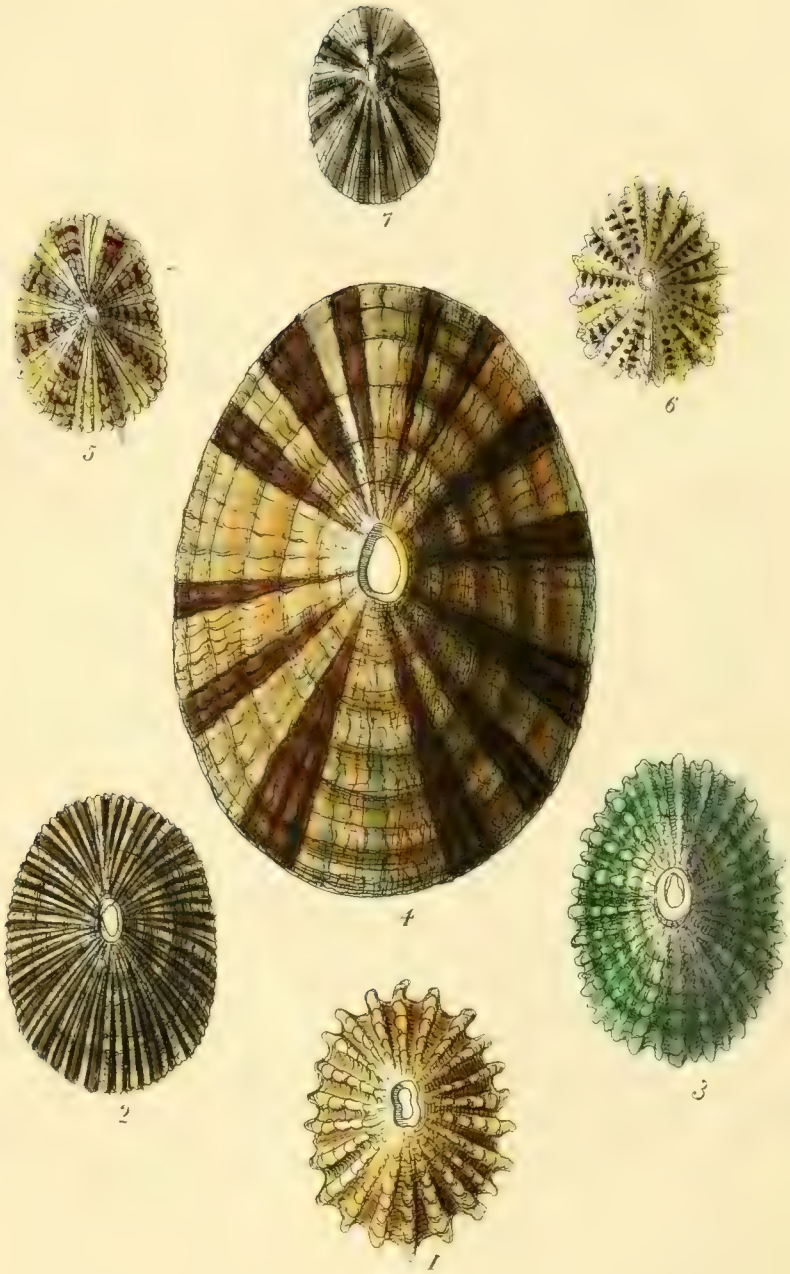
EMARGINULA FISSURATA, Sowerby, Genera of Shells, No. 34. f. 3.
Patella fissurata, Chemnitz.
Emarginula rubra, Lamarck.

FISSURELLA, Bruguière.

Testa ovata vel oblonga, depresso-conica, clypeiformis, margine lævi, rarò crenato; vertice antico, perforato; foramine irregulari, plerumque oblongo, striis seu radiis ad marginem decurrentibus. Impressio muscularis anticè latior, interrupta.

The distinguishing character of the Fissurellæ is that of having their shell perforated at the summit, for the purpose of conveying the water to the respiratory cavity. This perforation, which is generally of an oblong oval shape, was especially noticed by the early naturalists; and although the Fissurellæ or *Key-hole Limpets* were usually regarded as distinct from the *Patellæ* or *Common Limpets*, they were not elevated by those authors to the rank of a genus. Bruguière was the first to accomplish this desirable separation, and the propriety of it has been singularly confirmed by the later discovery of the important difference in the arrangement of the branchiæ. The genus Fissurella has now become one of considerable interest on account of the many beautiful new species that have been contributed by the exertions of Mr. Cuming; most of their shells exhibit an elegant variety of painting, and are highly esteemed by collectors.

The shell of Fissurella may be described as being ovate or oblong, and shaped like a shield or depressed cone; the margin is smooth, very rarely crenated; the vertex is anterior, and perforated, the orifice being generally irregular and oblong; and the outer surface is ornamented with variously coloured striæ or rays, running from the margin of the orifice down to the basal margin. The muscular impression is wider on the anterior side, and interrupted.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Several genera (*Macrochisma*, *Pupillia*, *Fissurellidea*, e. g.), founded upon certain minute variations, might with more propriety be considered as sectional divisions of the primitive genus.

The habits of the Fissurellæ are similar to those of the *Patellæ*.

Examples.

Pl. CXLI. Fig. 1.

FISSURELLA NODOSA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 593. Martini, Conch., vol. i. pl. 11. f. 94.
Patella nodosa, Born.
Patella spinosa, Gmelin.
Patella Jamaicensis? Gmelin.

Pl. CXLI. Fig. 2.

FISSURELLA NIMBOSA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 591. Martini, Conch., vol. i. pl. 11. f. 92.
Patella nimbosa, Linnæus.
Le Dasan, Adanson.

Pl. CXLI. Fig. 3.

FISSURELLA GRÆCA, Lamarck, Anim. sans vert., new edit. vol. vii. p. 592. De Blainville, Manuel de Malacologie, pl. 48. f. 3.
Patella Græca, Linnæus.
Le Gival, Adanson.

Pl. CXLI. Fig. 4.

FISSURELLA PICTA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 590. Martini, Conch., vol. i. pl. 11. f. 90.
Patella picta, Gmelin.

Pl. CXLI. Fig. 5 and 6.

FISSURELLA BARBADENSIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 595. Martini, Conch., vol. i. pl. 11. f. 93, 96 and 97.
Patella Barbadensis, Gmelin.
Patella perforata, Gmelin.
(Var. Fig. 6.) *Patella virescens*, Guilding.

Pl. CXLI. Fig. 7.

FISSURELLA CAYENENSIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 594. Deshayes, Enc. Méth. vers, vol. ii. p. 137.

Pl. CXLII. Fig. 8.

FISSURELLA ROSEA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 595. Martini, Conch., vol. i. pl. 12. f. 105.

Patella rosea, Gmelin.

Pl. CXLII. Fig. 9 and 11.

FISSURELLA CRASSA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 592.

(Fig. 9. Testa junior.)

Pl. CXLII. Fig. 10.

FISSURELLA HIANTULA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 597. Born, Mus., p. 414. Vign. f F.

Fissurella aperta, Sowerby.

Pupillia aperta, Gray.

Fissurellidea megatrema? D'Orbigny.

Pl. CXLII. Fig. 12.

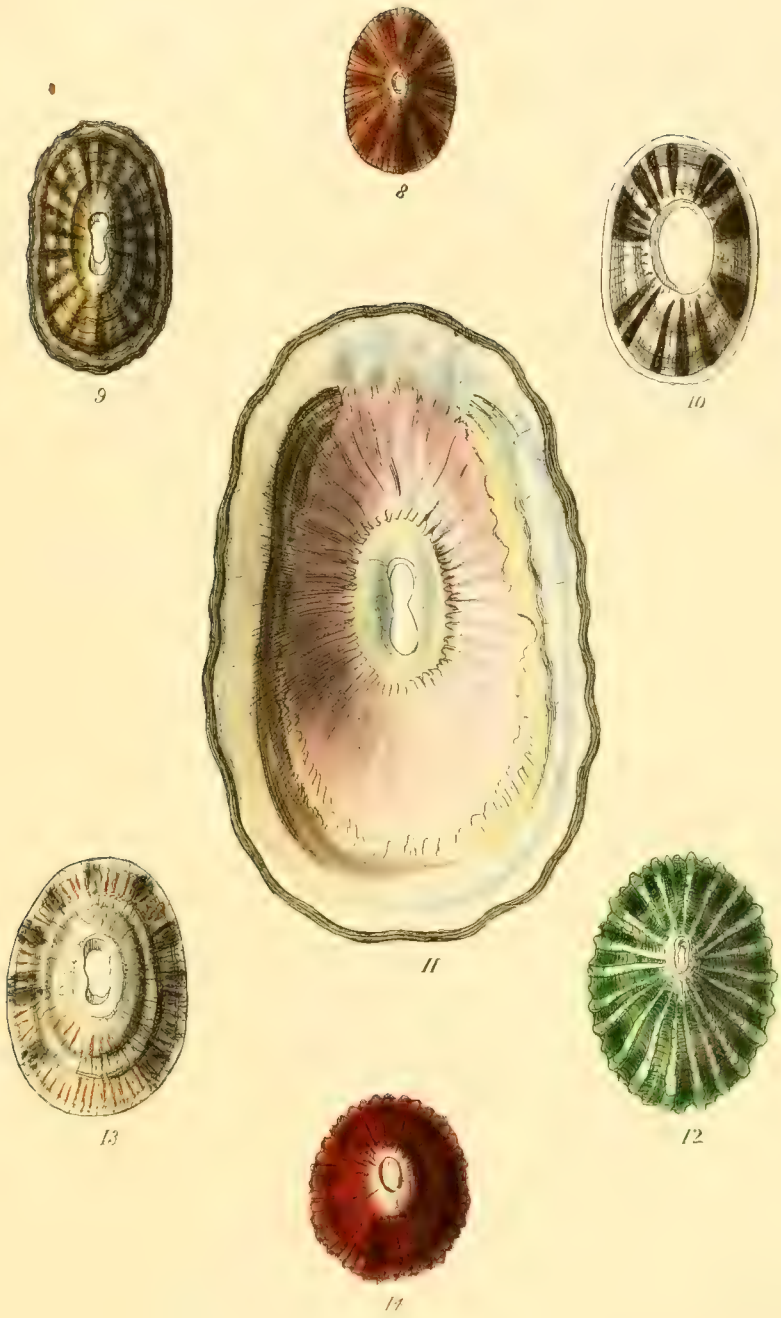
FISSURELLA JAVANIENSIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 598.

Pl. CXLII. Fig. 13.

FISSURELLA VIRIDULA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 596. Deshayes, Enc. Méth. vers, vol. ii. p. 187.

Pl. CXLII. Fig. 14.

FISSURELLA FASCICULARIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 598. Sowerby, Genera of Shells, No. 21. f. 6.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Family 2. CAPULACEA.

Testa pileiformis animal obumbrans, appendice testaceâ internâ plerumque instructa; cyatho aut laminâ solidâ interdum sustentata, tamen cardine aut ligamento nullo.

In this family we include nearly the same genera as were associated by Latreille under the title of *Les Pileiformes*, the cup-shaped *Calyptraciens* of Lamarck; they constitute a very natural and well-defined group, and are remarkable in being for the most part characterized by the development of an internal shelly appendage for the protection of the viscera. This appendage passes through a considerable modification of form, and its numerous varieties have been selected by authors for the purposes of subdivision. There is still, however, another interesting feature in the organization of the Capulacea, which is peculiar to this family, and may be regarded as a curious instance of natural economy; it is that of depositing a testaceous cup or plate as a support, in situations that do not afford good facilities of attachment. This singular property, discovered by Defrance as common to the *Hipponyces*, has been lately found by our zealous countryman Mr. Cuming belonging to two of the *Calyptrææ*.

The family of the Capulacea may be divided into four genera, as follows:

CREPIDULA.	HIPPONYX.
CALYPTRÆA.	PILEOPSIS.

CREPIDULA, Lamarck.

Testa ovata vel oblonga, transversìm elliptica; dorso sæpissimè convexo; subtùs cava, vertice, quasi spirâ, brevissimo, ad marginem

subobliquè inclinato. Apertura septo aut laminâ horizontali plus minusve clausa.

In carrying out the artificial arrangement of organic nature, it is curious to observe with what precision the whole system is gradually advancing to one complete chain of affinity by the discovery of kinds. The further we advance in the knowledge of creation, the more ineffectual becomes the ingenuity of the naturalist to perfect his system of arbitrary division. Most of us are wisely satisfied with the existing form of classification, esteeming it as safe and sufficient a formula as the memory requires in the study of this science; there are some, however, whose restless ambition prompts them to trace generic limits where none but the simplest modifications of character exist, and they delight in giving to every slight variation a local distinction and a name. Thus it is with the *Crepidulæ* and *Calyptrææ*; they are regarded by Gray as a separate family, including several genera; Deshayes, on the other hand, proposes to unite them; whilst Lamarck commences his observations by saying, "that amongst the conchiferous Gasteropods, no genus is so eminently *distinct* as that of Crepidula, whether as regards the *animal* or its *shell.*"

The fact is, that Lamarck was only acquainted with a few species, the typical forms of each division; and, as the intermediate varieties have since become known, some authors have been prompted to increase the number of genera, whilst others have at the same time advocated the propriety of diminishing it. For our own part, we see no reason to depart from the arrangement of Lamarck; we refer to the present genus, Crepidula, that portion of the Capulacea in which the internal appendage assumes the shape of a horizontal septum or shelf (*the Slipper Limpets*), and to the following one, *Calyptræa*, all those in which the septum gradually becomes modified, through the trochiform development, to the form of a detached cup (*the Cup-and-Saucer Limpets*).

The shell of Crepidula may be described as being ovate or oblong, transversely elliptic, generally convex at the back, and hollow beneath; the vertex, which in some species almost approaches to the form of a spire, is somewhat obliquely turned on one side at the margin, and the

1. Crepidula fornicata
2. .... Onyx nob
3. costata nob
4. .... aculeata
5. .... dilatata
6. unguiformis

aperture of the shell becomes more or less closed over with a horizontal shelf or plate.

Examples.

Pl. CXLIII. Fig. 1.

CREPIDULA FORNICATA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 641. Martini, Conch., pl. 13. f. 129 and 130.
Patella fornicata, Linnæus.

Pl. CXLIII. Fig. 2.

CREPIDULA ONYX, Sowerby, Genera of Shells, No. 23. fig. 2.

Pl. CXLIII. Fig. 3.

CREPIDULA COSTATA, Sowerby, Genera of Shells, No. 23. fig. 3.

Pl. CXLIII. Fig. 4.

CREPIDULA ACULEATA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 642. Chemn., Conch. vol. x. pl. 168. f. 1624, 1625.
Patella aculeata, Gmelin.

Pl. CXLIII. Fig. 5.

CREPIDULA DILATATA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 644.
Crepidula depressa? Deshayes.

Pl. CXLIII. Fig. 6.

CREPIDULA UNGUIFORMIS, Lamarck, Anim. sans vert., new edit., vol. vii. p. 642.
Patella crepidula, Linnæus.
Crepidula calceolina, Deshayes.

Pl. CXLIII. Fig. 7.

CREPIDULA PORCELLANA? Lamarck, Anim. sans vert., new edit., vol. vii. p. 642.
Patella porcellana, Linnæus.

CALYPTRÆA, Lamarck.

Testa conoidea, supernè plus minusve convexa, laminâ basali solidâ interdum sustentata; extùs aut lævis aut striata, interdum spinosa, vel foliata; vertice subcentrali, imperforato; appendice internâ vel cyathiformi, vel spirali.

Although Lamarck has undoubtedly become entitled to the credit of establishing many of the genera that are now commonly adopted, it must be remembered, that the greater part of them were certainly anticipated by the earlier naturalists in the sectional divisions of such as were then recognized. The Calyptrææ were thus distinguished, and had been long regarded as an important section of the *Patellæ*, including, as we have already noticed in our observations on the preceding genus, all those species whose shells exhibit an internal appendage approaching to the form of an inverted cup. Now, however, the genus Calyptræa may be said to include all the Capulacea in which the internal appendage does not exhibit the crepiduliform horizontal plate immediately crossing the aperture; thus connecting the several variations of growth that are at present known to exist between the two extreme forms of the cup and the slipper. The intermediate passage exhibits a complete trochiform growth (vide Pl. CXLIV. Fig. 2.), and has been separated as a genus by De Montford under the title of *Infundibulum*; Lesson, however, in the 'Voyage de la Coquille,' distinguishes the several varieties of the internal shelly development by the following seven divisions, adopting them as subgenera: *Crepidula*, *Crepipatella*, *Sigapatella*, *Trochapatella*, *Calyptræa*, *Calypeopsis* and *Syphopatella*.

We have now to notice a new and remarkable property which has been lately discovered by Mr. Cuming to belong to a mollusk whose shell is closely allied to that commonly known as the *Calyptræa equestris*. In the course of his late researches amongst the Philippines, our indefati-

gable traveller found a considerable number of the dead shells of this species lying on the sands; and in his anxiety to procure living specimens, was led to the discovery—that they deposit a calcareous plate for their support, analogous, no doubt, to that already observed in the *Hipponyces**. This shelly plate, although shapen to the surface of the rocky

* The following account, which Mr. Cuming has furnished us from his note-book, will be read with no little interest by conchologists:—

"On my arrival at the Island of Zebu, I found on coral reefs, which extend some distance from the shore, several shells similar to those commonly known as *Calyptræa equestris* lying dead amongst the debris. I sought for some days over a considerable space for living specimens, but in vain; at last curiosity and perseverance induced me to look further, when I thought of removing a mass of dead Coral that lay sunk about two feet in the sand just about low-water mark. I caused my attendants to lift it with the help of levers, and after much labour they raised it sufficiently for me to observe a living specimen of the animal I was in search of. It was adhering to the under surface, and upon my attempting to take it off by the shell, I was surprised to find that it rested upon a strong calcareous plate, of the shape of a flat saucer, evidently deposited to facilitate its attachment. My anxiety to secure perfect this interesting mollusk employed us for more than an hour in attempting to cleave the mass of Coral; I did this to enable me to break off that portion of it to which the animal was adhering, and, after great fatigue, we accomplished the task before the tide had risen too high to prevent our remaining upon the reefs. The next day I repeated my search; I caused several pieces of Coral to be lifted, and some few specimens were found under them; but the heavy blows that were required to break off the portions to which they adhered, either split, in most cases, the accessory plates, or chipped off the edges.

"On my arrival at the Island of Bohol, another of the Philippines, I again found a number of dead shells of the same mollusk upon the reefs, as well as some living specimens, in the same concealed situations as at the Island of Zebu; here, however, I was fortunate enough to obtain a second species of it. Although there were many of the dead shells lying on the shore, I found no specimens alive but what were adhering in this way to the under parts of large masses of Coral resting immediately on the beds of coral sand. There was no hollow space around the shells; they were absolutely pressed by the immense weight of the coral mass to some depth in the sand, and from the dark rusty appearance of the Coral when lifted up, I am led to conclude that they must have been in this extraordinarily confined situation for years, which accounts for their having so long escaped the notice of travellers.

"I have placed the animal of both species, which I brought home in spirits, in the hands of my friend Richard Owen, Esq., Professor of Comparative Anatomy at the College of Surgeons, for dissection.

"February 20th, 1842." "Hugh Cuming."

mass to which it adheres, was generally found deposited in parts comparatively smooth. The edge is finely crenulated, and turned up all round like a platter, as if to protect the basal margin of the cap-shaped shell which rests within it. Pl. CXLIV. Fig. 5. represents the cap-shaped shell, showing the internal laminal appendage; fig. 7, the shelly plate as deposited upon a fragment of coral rock; and fig. 6. exhibits both *in situ*; the shell, which is just raised to show the interior, has another smaller specimen adhering to it. The soft parts of this animal are in the hands of Professor Owen, who will now decide whether it should remain with the Calyptrææ, or whether it is entitled to a new generic distinction. The fact of Mr. Cuming having met with a second species of it, together with the evidence of his never having yet found any other of the Calyptrææ with a basal plate, strongly leads us to anticipate the latter. Professor Owen informs us, that if upon examination he finds such to be the case, he proposes to establish a new genus for it under the title of *Lithedaphus*; we therefore anxiously wait the result of his dissection.

The shell of Calyptræa may be described as being conoidal, more or less convex superiorly, and sometimes, though rarely, supported upon a solid basal plate; the outside is smooth or striated, sometimes spiny or foliated; the vertex is subcentral and imperforate, and the inside is furnished with a cup-shaped or spiral appendage.

Examples.

Pl. CXLIV. Fig. 1.

Calyptræa rugosa, Lesson, Magasin de Zoologie, 1834, Mollusques, pl. 2.

Subgenus *Calypeopsis*, Lesson.

Pl. CXLIV. Fig. 2.

Calyptræa radians, Deshayes, new edit. of Lamarck, vol. vii. p. 626. Enc. Méth. pl. 445. f. 3. Schub. and Wagn., Supp. to Chemnitz, p. 229. f. 4063 *a*. and 4064 *b*.

Trochus radians, Lamarck.

Plate CXLIV.

Patella trochiformis, Gmelin.
Lepas concamerata, Martini.
Infundibulum ——— ? De Montford.
Subgenus *Trochatella*, Lesson.

Pl. CXLIV. Fig. 3.

CALYPTRÆA LIGNARIA (var. *a.*), Broderip, Transactions Zool. Soc., vol. i. p. 199. pl. 27. f. 8*. D'Orbigny, Voy. dans l'Amérique Méridionale, pl. 58. fig. 7 to 9.

Pl. CXLIV. Fig. 4.

CALYPTRÆA CINEREA, *Nobis*. Proceedings Zool. Soc. 1842.

Pl. CXLIV. Fig. 5, 6 and 7.

CALYPTRÆA LITHEDAPHUS†.

HIPPONYX, Defrance.

Testa obliquè conoidea, pileiformis, poculo testaceo solido interdum sustentata; vertice retrorsùm inclinato; impressionibus muscularibus in formâ equi calcei anticè rotundatis, posticè connatis, in poculo æquè ac testâ imbutis.

The genus Hipponyx was instituted by Defrance for the purpose of associating certain of the *Pileopses* of Lamarck which he noticed to possess the singular property of depositing a solid shelly cup for their support. It was first observed by this author in the fossil state, and although it was not till some time after that any living specimens were found, he

† The word *lithedaphus* (from λίθος and ἔδαφος), signifying *a stone pavement*, is proposed by Professor Owen as characteristic of the singular habits of this mollusk; we therefore use it provisionally as a *specific* name, until we hear the result of his anatomical examination.

did not fail to discover that this property is in no way analogous to the common growth of bivalve mollusks. When the animal was at length examined by De Blainville, the closest affinity he could establish was that it might perhaps indicate a transition to the *Brachiopoda*, though not possibly belonging to the same class. The fact is, that the Hipponyces are true *cephalous* mollusks, belonging to the order of *cervicobranchiate Gasteropoda*, and intimately allied, as originally conjectured by Defrance and Lamarck, to the *Pileopses*; the two muscular impressions are very similar (compare Fig. 2, 3 and 4, Plate CXLV. with Fig. 2. Plate CXLVI.); indeed, Deshayes, as well as other authors of the present day, still refuses to separate them.

Like the basal plate of the *Calyptræa lithedaphus* (vide Pl. CXLIV. Fig. 5, 6 and 7.) the cup of Hipponyx can only be considered as an irregular accessory appendage deposited by the foot to facilitate the attachment of the animal, and therefore unnecessary to its existence. But the Hipponyces do not always exercise this property; they are, indeed, as often found without the cup as with it; for when they adhere to other shells, the same object is gained by absorbing a suitable place of attachment, on which may be traced the same muscular impressions. In this state they constitute a genus which is distinguished in Gray's classification by the title of *Sabia*.

The shell of Hipponyx may be described as being obliquely conoidal, cap-shaped, and sometimes, perhaps generally, supported upon a solid, testaceous cup; the vertex is bent backwards, and both the shell and the cup exhibit two strong muscular impressions, which are rounded anteriorly, and connated posteriorly in the form of a horse-shoe.

We have selected two fossil species as the most characteristic examples of this genus. Fig. 1 to 6 represent the shell of the first in different stages of growth; fig. 7, the outside of the cup; and fig. 8 and 9, the inside in different states. Fig. 10 and 13 represent different views of the outside of the shell of the second species; fig. 11, 14 and 15, of the inside of the same; and fig. 12 and 16 show the inside of two different specimens of the cup attached to portions of other shells.

1—9. Hipponyx Cornucopia. Defrance.
10—16. H. lævis.

Examples.

Pl. CXLV. Fig. 1 to 9. (fossil.)

HIPPONYX CORNUCOPIA, Defrance, Journ. de Phys., 1819. f. 1. De Blainville, Manuel de Malacologie, pl. 50. f. 1.
Patella cornucopia, Knorr.
Pileopsis cornucopia, Lamarck. Deshayes.

Pl. CXLV. Fig. 10 to 16. (fossil.)

HIPPONYX LÆVIS, Sowerby, Genera of Shells, No. 1.

PILEOPSIS, Lamarck.

Testa pileiformis, obliquè conica, epidermide subvelutinâ induta ; vertice uncinato ; aperturâ magnâ, rotundato-ellipticâ ; impressionibus muscularibus duabus lateralibus, anticè rotundatis, posticè connatis.

In the course of our observations on the preceding genus, it may have been noticed how entirely we differ from Sowerby in the views which we have formed of the true nature and organization of the *Hipponyces* ; they were regarded by this intelligent naturalist as true acephalous mollusks, brachiopodous, and wholly enveloped in a bilobed mantle ; we, on the contrary, have laboured, and we think successfully, to restore the affinity traced in them by Lamarck with the Pileopses, an affinity which is advocated in the present day both by De Blainville and Deshayes. They were set apart by Linnæus, Lister, and the early naturalists, on account of their cap-shaped growth, as a particular section of *Patella*, but were at length distinguished as a genus by De Montford under the title of *Capulus*, and by Lamarck under that which we have here adopted. The Pileopses evidently become fixed, without the power of displacing themselves ; they resemble the *Hipponyces* in possessing the property of forming for themselves a suitable place of attachment upon other shells, but not in that of depositing a protective cup or plate.

The shell of Pileopsis is described as being cap-shaped, obliquely conical, and covered with a soft velvety epidermis; the vertex is crooked, and the aperture is large and rotundately elliptic, exhibiting two lateral muscular impressions, which are connate posteriorly, and separately rounded anteriorly.

Example.

Pl. CXLVI. Fig. 1 and 2.

PILEOPSIS UNGARICA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 609. Pennant, Zool. Brit., pl. 93. f. 1.

Patella ungarica, Linnæus.

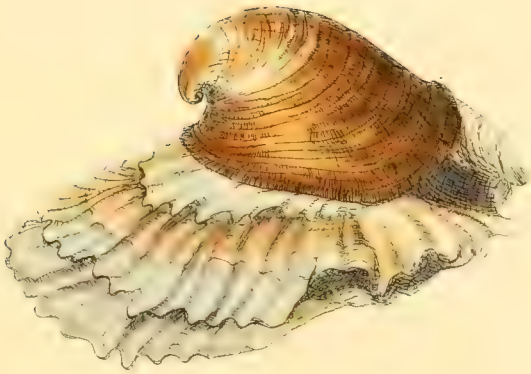
Capulus ungaricus, De Montford. Sowerby.

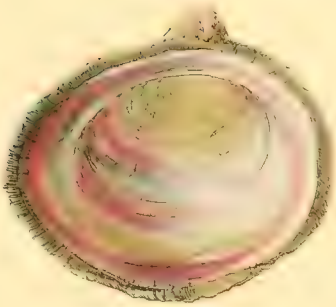
Family 3. MACROSTOMATA.

Testa paululùm convoluta, spirâ brevi; serie foraminum nonnunquam perforata; interdum intrà pallio plus minusve celata; aperturâ amplissimâ.

The Macrostomata or open-mouth Gasteropoda, which Lamarck first distinguished by the title of "Les Stomatacées," are placed here on account of their cervicobranchiate affinity with the *Capulacea*; they are moreover the first of the class whose shells exhibit an indication of the spiral growth. Lamarck, who did not devote that particular attention which is now given to the nature and position of the breathing organs, placed them after the *Neritacea* in consequence of the affinity that exists between the *Naticæ* and the *Sigareti*, so far, at least, as regards the fact of their shells being almost entirely concealed within the mantle. It must be allowed, however, that although the respiratory cavity in all the Macrostomata is cervical, a considerable difference may be observed in the arrangement of it; as between that of *Haliotis* and *Sigaretus*, for example. De Blainville and Deshayes, both of whom have entered more minutely than most authors into the nature and arrangement of the

Plate CXLVI.





Pleopsis ungarica.

branchiæ, have instituted a wide separation in the two genera just quoted. Deshayes distinguishes the first of these, together with Lamarck's *Stomatia* and *Stomatella*, as the *Scutibranchiata*; whilst the *Sigareti* are placed after the *Neritacea* in his order *Asiphonobranchiata*. De Blainville, on the other hand, for reasons of which we are not informed, assigns the *Stomatiæ* and *Stomatellæ* to different parts of his class (*Paracephalophora monoica*), whilst we are unable at present to distinguish so much as a generic difference between them. The *Stomatiæ* are united to the *Haliotides* in his order *Scutibranchiata*, and the *Stomatellæ* follow the *Sigareti* in his order *Chismobranchiata*.

The shell of the Macrostomata may be described as being a little convoluted, and sometimes perforated with a regular series of holes; the spire is short and the aperture very large; sometimes the shell is almost entirely enveloped by the mantle.

We refer the four following genera to this family:

VELUTINA.	STOMATIA.
SIGARETUS.	HALIOTIS.

VELUTINA, Gray.

Testa subglobosa, hemisphærica, epidermide tenui induta; spirâ parva, obtusâ, submarginali; aperturâ amplissimâ, rotundatâ, integrâ, margine acuto; columellâ arcuatâ umbilicum minutum partim occultante.

The *Bulla velutina* of Müller, erroneously cited by Lamarck as a synonym of the *Sigaretus haliotoideus*, was selected by Gray for the formation of this genus; it was also proposed about the same time by De Blainville, upon examination of a specimen sent to him by Defrance. It is said to partake of the characters of *Pileopsis* and *Sigaretus*, and may be considered both interesting and important on account of the affinity

which it establishes between the *Capulacea* and the *Macrostomata*, two families widely separated by Lamarck.

The shell of Velutina may be described as being nearly globose, hemispherical, and covered with a thin epidermis; the spire is small, obtuse and submarginal; the aperture is very large, rounded, entire, and sharp at the edge; the columella is curved, and partially conceals a small umbilicus.

Examples.

Pl. CXLVII. Fig. 1 and 2.

VELUTINA LÆVIGATA (?).
Sigaretus lævigatus, Lamarck, Anim. sans vert., vol. vi. 2nd part, p. 208.
Bulla velutina? Muller.

Pl. CXLVII. Fig. 3 and 4.

VELUTINA ZONATA, Gould, Invert. of Massachusets, p. 242. f. 160.

SIGARETUS, Lamarck.

Testa suborbicularis, subauriformis, plus minusve depressa, intrà pallio ferè occultata; spirâ brevi, parùm elevatâ; aperturâ dilatatâ, integrâ, latitudine superante; marginibus supernè sejunctis; impressionibus muscularibus duabus, lateralibus, subdistantibus.

Although Adanson was unacquainted with the animal inhabitant of his "*Sigaret*," he made a tolerable guess as to the situation it should occupy in the natural system in placing it with the *Haliotides*. Linnæus was less fortunate, for instead of falling into the arrangement of his contemporary, he included it with the *Helices* (*Helix haliotoidea*). It must, however, be remembered that some authors, especially De Blainville and Deshayes, still refuse to allow that any affinity exists between the *Sigareti* and the *Haliotides*; for, like the *Naticæ*, their shells are almost entirely enveloped within the mantle.

Plate CXLVII.

G. B. S. Junr

Plate CXLVIII.

1. *Sigaretus concavus.*
2. . . . . *haliotoideus.*
3. . . *Leachii.*
4. . *canaliculatus.*

The shell of Sigaretus is described as being nearly orbicular, somewhat ear-shaped, more or less depressed, and nearly concealed within the mantle; the spire is short, but little elevated, and the aperture is very much dilated, entire, and wider than it is long: the margins are disjoined superiorly, and the interior exhibits two lateral and rather distant muscular impressions.

We cannot appreciate the genus *Cryptostoma* of De Blainville; it certainly belongs to Sigaretus; indeed Sowerby asserts that his *Cryptostoma Leachii* is the true "*Sigaret**" of Adanson.

Examples.

Pl. CXLVIII. Fig. 1.

SIGARETUS CONCAVUS, Lamarck, Anim. sans vert., vol. vii. p. 208. Deshayes, Enc. Méth. vers, vol. iii. p. 950.

Pl. CXLVIII. Fig. 2.

SIGARETUS HALIOTOIDEUS†? Lamarck, Anim. sans vert., vol. vii. p. 208. Martini, Conch., vol. i. pl. 16. f. 151 to 154.
Helix haliotoidea, Linnæus.
Le Sigaret, Adanson.

Pl. CXLVIII. Fig. 3.

SIGARETUS LEACHII, Sowerby, Genera of Shells, No. 19.
Cryptostoma Leachii, De Blainville.

Pl. CXLVIII. Fig. 4. (fossil.)

SIGARETUS CANALICULATUS, Defrance. Sowerby, Genera of Shells, No. 19.

* The genus *Sigaretus* appears to be altogether omitted in Gray's classification of the Mollusca in the Museum Synopsis; but by the situation of *Cryptostoma*, we are inclined to suppose he would have referred it to his family of *Naticidæ*.

† Deshayes asserts, that the shell which is here figured from Sowerby's 'Genera' is the true *Sigaretus concavus* of Lamarck, and therefore neither the *Helix haliotoidea* of Linnæus, nor *le Sigaret* of Adanson. He considers Fig. 1. to be a new species from the coast of Peru.

STOMATIA, Lamarck.

Testa suborbicularis vel oblongo-auriformis, plus minusve depressa, imperforata; extùs aut lævis, aut striata, aut imbricata, aut carinata; intùs margaritacea; spirâ plerumque prominente, interdum inconspicuâ; aperturâ amplissimâ, sæpiùs latitudine superante; marginibus integris, supernè conjunctis.

Although De Blainville has very widely separated the Stomatiæ and *Stomatellæ* of Lamarck, we certainly cannot discover even a generic difference between them; we have therefore, in accordance with the opinion of Sowerby, united them. They were separated from the *Haliotides* by Lamarck on account of their shells not being perforated, and the *Stomatellæ* were afterwards distinguished from the Stomatiæ, as having shells that are neither keeled nor ribbed.

The shell of Stomatia may be described as being either suborbicular or of an oblong ear-shape, more or less depressed, and imperforate; the outside is either smooth, striated, imbricated, or carinated, the inside pearly; the spire, though generally prominent, is sometimes almost inconspicuous; the aperture is very large, and most frequently wider than it is long; the margins are entire and joined superiorly.

Examples.

Pl. CXLIX. Fig. 1.

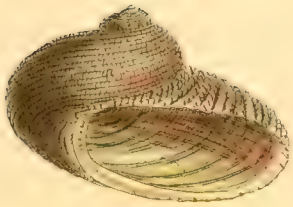
STOMATIA IMBRICATA, Sowerby, Genera of Shells, No. 19. Enc. Méth., pl. 450. f. 2. *a*, *b*.

Stomatella imbricata, Lamarck.

Pl. CXLIX. Fig. 2.

STOMATIA SULCIFERA, Sowerby, Genera of Shells, No. 19.

Stomatella sulcifera, Lamarck.



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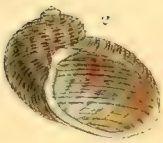

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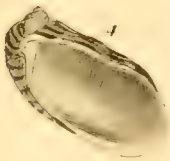

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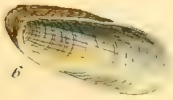

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1. *Stomatia umbricata*
2 *sulcifera*
3 *duplicata*
4 *Plumotis*
5 *Auricula*
6. *planulata*

Pl. CXLIX. Fig. 3.

STOMATIA DUPLICATA, Sowerby, Genera of Shells, No. 19.

Pl. CXLIX. Fig. 4.

STOMATIA PHYMOTIS, Lamarck, Anim. sans vert., vol. vi. p. 211. Enc. Méth., pl. 450. f. 5. *a*, *b*.
Haliotis imperforata, Chemnitz.

Pl. CXLIX. Fig. 5.

STOMATIA AURICULA, Sowerby, Genera of Shells, No. 19. Enc. Méth., pl. 450. f. 1.
Patella lutea, Gmelin.
Stomatella auricula, Lamarck.

Pl. CXLIX. Fig. 6.

STOMATIA PLANULATA, Sowerby, Genera of Shells, No. 19. Enc. Méth., pl. 450. f. 4. *a*, *b*.
Stomatella planulata, Lamarck.

HALIOTIS, Linnæus.

Testa ovata vel oblongo-ovata, auriformis, plus minusve depressa, serie foraminum perforata; intus margaritacea, prismatica, extus plerumque rugosa aut corrugata; spirâ brevissimâ, sublaterali; aperturâ amplissimâ, columellâ sæpissimè planulatâ.

There are, perhaps, few genera of mollusks whose shells may be more readily distinguished than those of the Haliotides; they were originally associated by Klein under the title of *Auris*, but this appellation was exchanged by Linnæus for that which is now commonly adopted. The chief peculiarity of these animals is, that of having their shells perforated with a regular series of holes for the free passage of the water to the respiratory

cavity, analogous in some measure to the vertical hole in those of the *Fissurellæ*. The holes are ranged in a straight line running parallel with the columellar lip; and being required only in that part of the shell which covers the branchial cavity, those nearest the spire become filled up, whilst new ones are formed as the shell advances in growth.

The Haliotides exhibit a very peculiar assemblage of characters, and authors have been much divided in their opinions as to the situation they should occupy in the natural system. Linnæus considered them as affording a transition from the non-spiral to the spiral univalves, placing them next to the *Patellæ*; Lamarck regarded them at one time as intimately allied to the *Chitones*, but subsequently to the *Sigareti* and *Neritæ*; whilst Cuvier and De Blainville have rather approached to the arrangement of Linnæus in placing them near to the *Capulacea*.

The genus *Padollus* of De Montford was proposed for those species whose shells exhibit a longitudinal groove.

The shell of Haliotis may be described as being ovate or ear-shaped, more or less depressed, and perforated with a straight series of holes; the inside is pearly and prismatic, the outside rough and often wrinkled; the spire is very short and sublateral; the aperture large, and the columella generally flat

Examples.

Pl. CL. Fig. 1.

HALIOTIS EXCAVATA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 215.

Pl. CL. Fig. 2.

HALIOTIS ASININA, Linnæus, Syst. Nat., p. 1256. Martini, Conch., vol. i. pl. 16. f. 150.

Haliotis asinium, Gmelin.

Pl. CL. Fig. 3.

HALIOTIS PARVA, Linnæus, Syst. Nat., p. 3689. Martini, Conch., vol. i. pl. 14. f. 140.

Haliotis canaliculata, Lamarck.

Padollus ———— ? De Montford, Gray.

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1. *Haliotis excavata*.
2. *Asinina*.
3. . . *parva*.

Family 4. TUBISPIRACEA.

Testa tubulosa, irregulariter contorta; spirâ laxâ, interdum fissurâ per totam longitudinem decurrente. Animal operculo corneo instructum.

Linnæus and his predecessors, who were but little acquainted with the animal inhabitants of tubular shells, assigned nearly the whole of them, without speculating upon what might be their nature or anatomy, to one common genus, *Serpula*. These tubular shells were, however, at length found to contain animals of varied organization; his *Serpula aquaria*, for example, was found to be an acephalous mollusk, *Aspergillum*; his *Serpulæ anguina* and *vermetus* to be true cervicobranchiate Gasteropoda, forming the types of the two genera, *Siliquaria* and *Vermetus*, associated in this family; whilst the rest of them, distinguished by subsequent authors as the genera *Serpula*, *Spirorbis*, *Galiolaria*, *Vermilia*, &c., are found to belong to another division of the animal kingdom, the *Annelides*.

The shell of the Tubispiracea may be described as being tubular, and irregularly twisted into a loose spire, with sometimes a slit running throughout its entire length. The animal is furnished with a horny operculum.

The two following genera may be referred to this family:

Siliquaria. Vermetus.

SILIQUARIA, Bruguière.

Testa tubulosa, subcylindrica, irregulariter contorta, posticè plus minusve attenuata, in spiram laxè producta; anticè evolutior, extremitate

apertâ; fissurâ, interdum subarticulatâ, per totam longitudinem decurrente. Operculum multispirale.

The *Serpula anguina* of Linnæus was selected by Bruguière for the formation of this genus, on account of the longitudinal slit by which the shell is remarkably characterized. As, however, he was unacquainted with its animal inhabitant, the genus *Siliquaria* was still left amongst the *Annelides*; neither Cuvier nor Lamarck proposed any alteration, but De Blainville ventured to remove it to a place amongst the *Mollusca*, upon the very laudable conjecture that the longitudinal fissure might probably be destined to answer the same purpose as the vertical perforation in the shell of *Fissurella*; "*la position médiane de la fissure pourroit même faire soupçonner dans l'animal quelque chose d'analogue à ce qui ce voit dans les Fissurelles.*" These suspicions were subsequently verified; for upon M. Ardouin obtaining the opportunity of examining the animal, it was found to be a true cervicobranchiate mollusk, furnished with an operculum. The fissure is, in fact, situated over the branchial cavity for precisely the same purpose as the row of perforations in the shell of Haliotis, and in like manner it becomes partially filled up and formed anew as the shell advances in growth.

The shell of Siliquaria may be described as being tubular, somewhat cylindrical, and irregularly twisted; the posterior end is more or less attenuated, and loosely produced into a spire, which becomes unrolled towards the anterior end, the extremity being open; and the fissure, which is sometimes a little articulated, runs throughout its entire length.

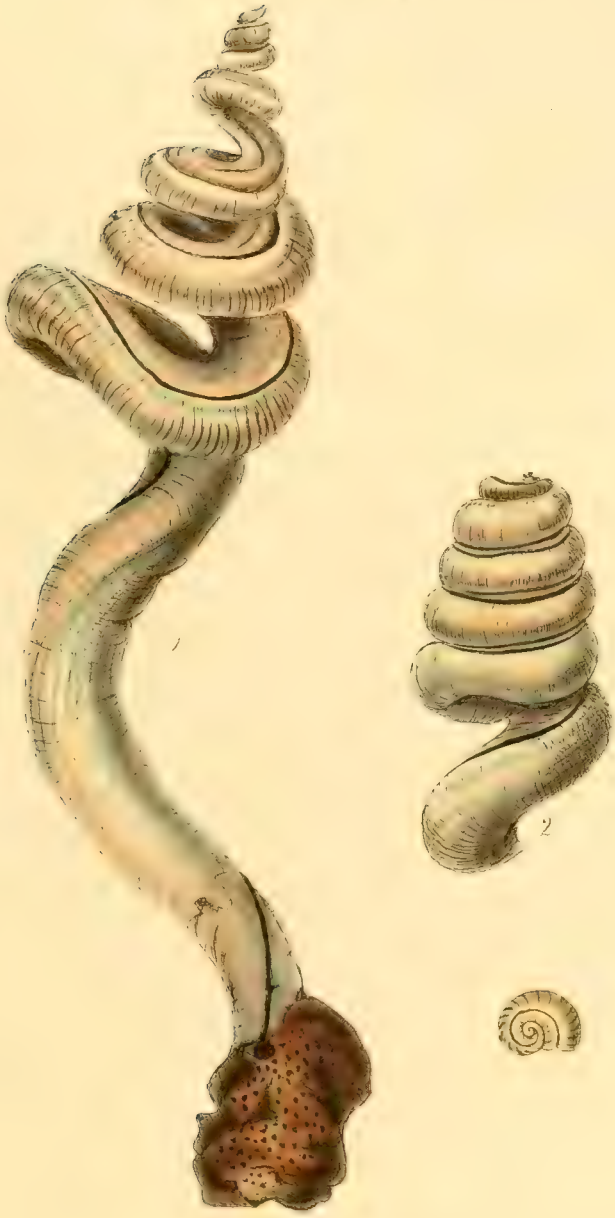
Example.

Pl. CLI. Fig. 1 to 3.

SILIQUARIA ANGUINA, Lamarck, Anim. sans vert., vol. v. p. 337. Born. Mus., pl. 18. f. 15.

Serpula anguina, Linnæus.

Agathirses ——— ? De Montford.



Siliquaria anguina.

VERMETUS, Adanson.

Testa tubulosa, subcylindrica, irregulariter contorta, posticè plerumque attenuata, in spiram laxatam sæpissimè producta, anticè evoluta, interdum erecto-undata; internè septis interdum divisa, aperturâ rotundâ, simplici. Operculum corneum, concavum.

The genus Vermetus, proposed by Adanson, was rightly placed by him with the Mollusca, and may be remarked as affording another instance of how much Linnæus might have profited in his arrangement of the 'Systema Naturæ,' if he had given more attention to the discoveries of this intelligent traveller. The alterations and amendments of this naturalist, though established upon actual observation, were no doubt looked upon by our great author as both dangerous and unnecessary. It was some time before even Lamarck appreciated the arrangement of Adanson, for the genus under consideration was originally referred by him to the Serpulaceous Annelides, under the appellation of *Vermicularia*; the title of Vermetus was afterwards restored by De Roissy, and Lamarck was forced to acknowledge the propriety of observing it. Cuvier appears to have been the first to have followed Adanson in placing the Vermeti with the Mollusca; and the only opinion upon which authors are now divided is as to whether they approximate to the *Siliquariæ* or to the *Scalariæ*. The animal has been recently described and figured both by Quoy, and d'Orbigny.

The shell of Vermetus may be described as being tubular, subcylindrical, and irregularly twisted; the posterior end is generally attenuated, and most frequently produced into a loose spire; the anterior is unrolled, and sometimes erect; the interior of the shell is often divided by transverse septa, and the aperture is round and simple. The operculum is horny and concave.

Examples.

Pl. CLII. Fig. 1.

VERMETUS LUMBRICALIS, Lamarck, Anim. sans vert., vol. vi. p. 225. De Blainville, Manuel de Malacologie, pl. 34. f. 1.
Le Vermet, Adanson.
Serpula vermetus, Sowerby.

Pl. CLII. Fig. 2.

VERMETUS EBURNEUS*, *Nobis*, Proceedings Zool. Soc., 1842.

Order IV. GASTEROPODA PLEUROBRANCHIATA.

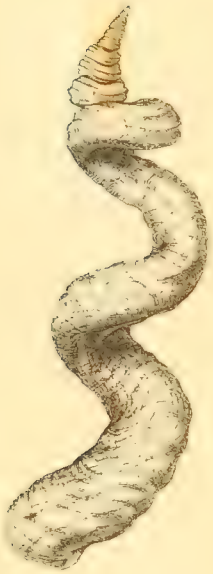
Branchiæ latere dextro semper impositæ, seu sub margine pallii, seu in cavitate speciali.

This order is intended for the reception of certain mollusks which have their branchiæ situated on the right side only of the body, whether placed under the edge of the mantle, as in the order *Cyclobranchiata*, or in a particular cavity, as in most of the *Cervicobranchiata*. A very natural group of animals is thus brought together, which are as closely allied by other and perhaps more important affinities. The Pleurobranchiata are not all conchiferous, and the greater part of those that are, have merely a thin, horny shell concealed within the mantle, either on the back, or over the branchial cavity.

They are divided into three families, as follows:

BULLACEA. APLYSIANA.
SEMIPHYLLIDIANA.

* This beautiful species was brought by Mr. Cuming from South America.



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1

Family 1. BULLACEA.

Testa fragilis, leviter convoluta, patentissima, partim vel omnino interna.

The family of the Bullacea, "*Les Bulléens*" of Lamarck, "*Les Acères*" of Cuvier and De Férussac, include a small group of mollusks provided with a fragile, lightly-convoluted shell, either partially or altogether concealed within the mantle. They have no great affinity with the *Macrostomata* or the *Tubispiracea*, but are closely allied to the *Semiphyllidiana*; for to whatever part of the system they have been assigned by authors, they are always to be found associated with the *Aplysiæ* and *Dolabellæ*, from which they differ only in having no tentacula.

Those of the Bullacea that are conchiferous may be included in the following genus:

BULLA.

BULLA, Klein.

Testa tenuis, interdum fragilissima, ovata vel subcylindrica, lævigata, leviter convoluta; spirâ brevi aut depressâ, aut concavâ, rarò prominente; aperturâ magnâ, interdum patentissimâ, labio versus apicem paululum inflexo.

The Bullæ appear to have excited no little confusion amongst the early naturalists; for whilst they were described by Muller under the title of *Lobaria*, their shells were figured by Klein and others under that which is now retained; and both these were introduced by Gmelin in his edition of the 'Systema Naturæ' as animals of a different order; the title of *Lobaria* is, however, still retained by De Blainville in reference to some naked mollusks belonging to this family. The genus Bulla of Linnæus

included many species of very anomalous construction, such, for instance, as are now referred to the genera *Achatina*, *Pyrula*, *Ovulum*, *Terebellum*, &c.; Bruguière, however, may be said to have established a complete reformation, retaining it for the reception of only those thin fragile bubble shells of which the *Bulla fasciata* or *lignaria* may be regarded as the type. The genus *Bullæa* of Lamarck, *Scaphander* of De Montford, was proposed for the purpose of distinguishing the *Bulla aperta*, on account of its shell being very slightly convoluted, and entirely concealed within the mantle. But De Roissy, in adopting this genus, included the *Bulla lignaria*, in consequence of a peculiarity which it has in common with that species, namely, the internal structure of the stomach, which in both cases is protected with three shelly plates. Another genus was also proposed by De Férussac, with the appellation of *Bullina*, for those species in which the edge of the frontal disc is produced into lobes, and whose shells have prominent spires; the *Bulla naucum*, too, is the genus *Atys* of De Montford.

The shell of Bulla may be described as being thin, sometimes very fragile, ovate or subcylindrical, smooth, and lightly convoluted; the spire is short, depressed or concave, and rarely prominent; the aperture is large, sometimes very open, and the outer lip is generally a little inflected towards the apex.

Examples.

Pl. CLIII. Fig. 1.

Bulla fasciata, Bruguière, Dict., No. 15. Enc. Méth. pl. 359. f. 1. *a*, *b*. Chemn. Conch., vol. x. pl. 146. f. 1348 and 1349.

Bulla velum, Gmelin.

Pl. CLIII. Fig. 2.

Bulla aplustre, Linnæus, Syst. Nat. p. 1184. Enc. Méth., p. 359. f. 2. *a*, *b*. Chemn., Conch., vol. x. pl. 146. f. 1350 and 1351.

Aplustra ——— ? Schumacher.

Pl. CLIII. Fig. 3.

Bulla aperta, Linnæus, Syst. Nat., p. 1183. Chemn. Conch., vol. x.

Plate CLIII.

pl. 146. f. 1354 and 1355. Cuvier, Ann. du Mus., vol. i. p. 12. f. 1 to 6.
Bullæa aperta, Lamarck.
Scaphander aperta, De Montford.
Lobaria quadriloba, Gmelin.
Amygdala marina, Plancus.

Pl. CLIII. Fig. 4.

BULLA CALYCULATA, Sowerby, Genera of Shells, No. 39. f. 5.
Bulla viridis, Rang. Quoy and Gaimard.

Pl. CLIII. Fig. 5.

BULLA LIGNARIA, Linnæus, Syst. Nat., p. 1184. Martini, Conch., vol. i. pl. 21. f. 194 and 195. Enc. Méth., pl. 359. f. 3. *a*, *b*.

Pl. CLIII. Fig. 6.

BULLA SCABRA. Chemnitz, Conch., vol. x. p. 118. pl. 146. f. 1352 and 1353. Deshayes, new edit. of Lamarck, vol. vii. p. 677.
Bullina scabra, De Férussac.

Pl. CLIII. Fig. 7 and 8.

BULLA ALBOCINCTA, Van der Hoeven, Leyden Journ. Nat. Hist., D. VI. St. 4. p. 245. pl. 10.

Family 2. SEMIPHYLLIDIANA.

Testa planulata, cornea aut calcarea, vel externa vel interna, dorso affixa.

The *Cyclobranchiate* Gasteropoda, which include the genera *Chiton*, *Chitonellus* and *Patella*, were associated by Lamarck under the title of "*Les Phyllidiens*," because of the branchiæ being arranged in a circle round the edge of the mantle. Now, in the animals which come under

our present consideration, the breathing organs exhibit this arrangement on the right side only; that is, but half way round the mantle, so that on this account he called them "*Les Semiphyllidiens.*" This, however, as Lamarck himself acknowledged, is the only affinity between these two families, and therefore scarcely sufficient to establish the propriety of placing them together, when they differ so much in other respects. The Semiphyllidiana are, in fact, more nearly allied to the Aplysiana, and we have therefore ventured to follow Deshayes in placing them in their immediate vicinity. Their shell is smooth, being sometimes calcareous, sometimes horny, and either external or internal.

The family of the Semiphyllidiana includes two genera, as follows:

PLEUROBRANCHUS. UMBRELLA.

PLEUROBRANCHUS, Cuvier.

Testa interna, dorsalis, obliquè-ovata, cornea, planulata, subauriformis, supernè convexiuscula; vertice laterali, submarginali, subterminali, inflexo; margine integro.

Although we are indebted to Cuvier for the above generic title, as well as for an accurate description of the animal to which it is applied, it must not be forgotten that the Pleurobranchus was first noticed by our countryman Montague as his *Bulla plumula*. The attention of both these writers appears to have been arrested by the change and peculiarity of the branchiæ; the former title was selected as indicating their right-sided position, the latter as exhibiting their plumose structure. It was not until some time afterwards that the Pleurobranchi were found to be occasionally conchiferous, the shell in such cases being small, and merely of a thin horny texture, concealed within the fleshy substance of the mantle.

The shell of Pleurobranchus may be described as being internal, dorsal,

Pleurobranchus membranaceus.

obliquely ovate, flat, and somewhat ear-shaped, being convex superiorly; the vertex is situated near the edge, and bent inwards; and the margin is entire.

Example.

Pl. CLIV. Fig. 1 and 2.

PLEUROBRANCHUS MEMBRANACEUS, Fleming. Sowerby, Genera of Shells, No. 35.

UMBRELLA, Lamarck.

Testa externa, dorsalis, orbicularis, planulata; supernè convexiuscula, albida, vértice minimo, subcentrali; infernè concaviuscula, disco centrali, fusco-colorato, impressione musculari irregulari, continuâ, ad centrum circulariter imbuta.

The genus which we have now to consider appears to have been first proposed by Lamarck under the title of *Acardia*; but as this appellation had been used by Bruguière in reference to another class of animals, he subsequently abandoned it for that of Umbrella. It was not, however, until some time afterwards that the genus Umbrella was recognized by Cuvier; for although he admitted that the shell, which had been long known as the "*Parasol Chinois*," appeared to differ from the *Patellæ*, he cautiously refused to allow it a generic distinction until the nature of its animal became known. The anatomy of the Umbrellæ was subsequently described by De Blainville; his description was rather incomplete at the time, but it has been since perfected by Deshayes.

An error was committed some years since by De Blainville in the formation of a new genus under the title of *Gastroplax*, from a specimen of Umbrella that had its shell artificially cemented to the ventral disc; and as many authors have taken considerable pains to expatiate upon this error, even after he had acknowledged it as such in his 'Manuel de Malacologie,' we shall here do him the justice to quote his own words:

"Parce que le seul individu que nous avions vu, avoit sa coquille, *probablement par artifice*, collée ou attachée sous le pied."

The shell of Umbrella may be described as being external, dorsal, orbicular, and smooth; the upper surface is rather convex, and generally white, the vertex being very small, and situated near the centre; the under surface is rather concave, and has the central disc of a brown-yellowish colour, with an irregular, continuous, muscular impression running around it.

Example.

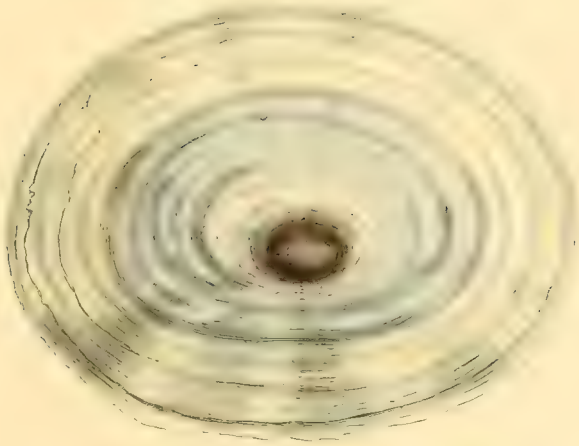
Pl. CLV. Fig. 1 and 2.

UMBRELLA INDICA, Lamarck, Anim. sans vert., new edit., vol. vii. p. 573.
Chemnitz, Conch., vol. x. pl. 169. f. 1645 and 1646.
Patella umbellata, Gmelin.

Family 3. APLYSIANA.

Testa vel cornea, vel calcarea, intra pallium, branchiarum tutamine, celata.

The Aplysiana constitute another small family of mollusks in which we find no little difficulty in establishing a good generic division; for whilst De Férussac, Rang, and Deshayes have advocated the propriety of including them in one and the same genus, Lamarck, Sowerby, and De Blainville have continued to separate them. They resemble the *Semiphyllidiana* in their general anatomy, and like most of that family, have the shell concealed within the fleshy substance of the mantle; instead, however, of being inserted on the back, it covers the branchial cavity. The branchiæ agree in being situated on the right side only of the body, but not in their arrangement: in the *Semiphyllidiana* they are placed under the edge of the mantle; but in this family they are situated in a particular cavity, which the shell is destined to protect.



Umbrella indica.

The family of the Aplysiana may be divided into two genera, as follows:

APLYSIA. DOLABELLA.

APLYSIA, Linnæus.

Testa interna, convexiuscula, subcompressa, tenuissima, cornea; posticè parùm acuminata, vertice introrsùm subrostrato; anticè rotundata.

The *Aplysia depilans* of Linnæus, which may be regarded as the type of this genus, appears to have been one of the first of molluscous animals to attract the attention of naturalists. From its singular resemblance in form to a crouching hare, which similitude is increased by the ear-shaped structure of the tentacula, this mollusk has received the appellation of the *Sea-Hare*; *Lepus marinus* of the Latins; Λαγὼς θαλάττιος of the early Greeks; and by the latter especially, as we learn from Nicander, the Aplysia was regarded with no little superstition. They believed that it exuded both a poisonous odour, and a poisonous liquor; and even Pliny has recorded instances of extraordinary credulity respecting certain properties assigned to this animal, which it would be only frivolous and unnecessary to notice. Although the subject of the present genus had been so long known, Rondelet seems to have been the first to give anything like a detailed account of it; Linnæus merely followed his description, and little more was added until its complete anatomy was set forth in the elaborate memoirs of Cuvier and Rang; we cannot, however, be surprised that the ancients should have known but little of an animal which they regarded with so much fear and superstition. The Aplysiæ were arranged by these authors with the rest of the naked mollusks; but as it was subsequently thought necessary to separate the water-breathing from the air-breathing kinds, the *Limacinea* were referred to a distinct order, *Pulmobranchiata*, whilst the Aplysiæ and others were still further subdivided according to variations in the position or structure of the

branchiæ. The Aplysiæ are not all conchiferous, nor do they in any case exhibit more than an internal membranaceous shell, inserted in that part of the mantle which covers the branchial cavity. It may be described as being rather convex, somewhat compressed, very thin, and always horny; the posterior side is a little acuminated, with the vertex somewhat beaked inward, and the anterior side is rounded.

Examples.

Pl. CLVI. Fig. 1 and 5.

APLYSIA PETERSONI, Sowerby, Genera of Shells, No. 39.

Pl. CLVI. Fig. 2.

APLYSIA BRASILIANA, Rang, Hist. Nat. des Aplysies, pl. 8. f. 1 to 3. Deshayes, new edit. of Lamarck, vol. vii. p. 691.

Pl. CLVI. Fig. 3.

APLYSIA CONCAVA, Sowerby, Genera of Shells, No. 39.

Pl. CLVI. Fig. 4.

APLYSIA QUADRATA, Sowerby, Genera of Shells, No. 39.

DOLABELLA, Cuvier.

Testa interna, calcarea, interdum subcornea, dolabriformis, integumento corneo sæpè induta; posticè angustata, crassior, callosa, subspiralis, margine subreflexo; anticè planulata, latior, margine integro.

The Dolabellæ were distinguished by Cuvier, in the first place, owing to an evident change in the structure of their shells; and, in the second place, owing to their being for the most part solid and calcareous; they are nevertheless so closely allied to the *Aplysiæ* in their organization and

Plate CLVI.

Dolabella Rumphii.

habits, that authors have been for a long time divided upon the propriety of separating them. For our own part, we see no reason to depart from the arrangement of Cuvier and Lamarck, and therefore retain the genus Dolabella, describing the shell to be internal and calcareous, though sometimes partially horny; generally more or less covered with a horny integument, and in shape somewhat resembling a hatchet; the posterior side is narrow, thicker, somewhat spiral, and a little reflected over at the edge; the anterior side is smooth, wider, and entire at the margin.

Example.

Pl. CLVII. Fig. 1 and 2.

Dolabella Rumphii, Cuvier, Ann. du Mus., vol. v. p. 437. pl. 29. f. *r*.
De Blainville, Manuel de Malacologie, p. 473. pl. 43. f. 5.
Limax marina, Rumphius.
Doris verrucosa, Gmelin.
Aplysia Rumphii (?), Deshayes, &c.

Order V. GASTEROPODA NUCLEOBRANCHIATA.

Branchiæ plumatæ, in nucleo dorsali coalitæ; nucleo testâ vitreâ pellucidâ obtecto.

We have now to describe a class of mollusks exhibiting a more distinct peculiarity of organization than any that have been yet noticed. They have received the above title on account of their branchiæ, which are feathered, being enclosed in a lump or nucleus protruding from the back, and this nucleus is covered with a transparent glassy shell, in a manner distantly analogous to the way in which the branchial cavity is protected in the *Aplysiæ*. This is indeed the only reason that can be assigned for placing them in the immediate vicinity of that genus; for although the general type of their organization agrees with that of the Gasteropoda, it

passes through a wide degree of modification. The ventral disc, for example, which is so prominent a feature in the rest of the class, is here represented by a gelatinous natatory fin; and the animal, scarcely ever at rest, is made to swim longitudinally on the surface of the water with its shell downwards.

The following genus is the only one of the family of the Nucleobranchiate Gasteropoda that can be said to be conchiferous:

CARINARIA.

CARINARIA, Lamarck.

Testa conica, pileiformis, tenuissima, hyalina, lateribus subcompressa; vertice valdè attenuato, in spiram incurvam plus minusve reflexo, dorso carinâ aut simplici, aut dentatâ, instructo; aperturâ oblongâ, amplissimâ, integrâ; impressione musculari nullâ.

The genus Carinaria was instituted by Lamarck for the purpose of distinguishing a beautifully transparent glassy shell, which, in the absence of its animal inhabitant, had been regarded by Linnæus as a species of *Patella*. Gmelin was as ignorant as his predecessor of the true nature and purposes of this shell; but upon considering its very apparent want of affinity with any of those of the *Patellæ*, he was induced to remove it, in the 13th edition of the 'Systema Naturæ,' to a place amongst the *Argonauts*. Here, however, it was not destined to remain long, for upon the discovery of the soft parts, the Carinariæ were found to be much larger animals than had been anticipated; the purpose of the shell, as we have already stated, being merely to cover a small dorsal nucleus containing the organs of respiration.

The Carinariæ, by their peculiar system of organization, have given rise to much speculation amongst naturalists as to the situation they should occupy in the system. Lamarck continued to place them next to the

Argonautæ, though in a separate class, *Heteropoda*, upon the presumption of their being allied to the *Cephalopoda*. Now, however, no one attempts to argue that there is any resemblance between the Carinariæ and the *cephalopodous* mollusks; their affinity with the *Argonauts* is contested only by those, who, in still foolishly regarding the animal usually found in the well-known papyraceous shell as a parasite, believe its true owner and fabricator to be probably some huge nucleobranchiate. In our observations on the genus *Argonauta*, we shall endeavour to show more fully how entirely this extravagant hypothesis has been refuted by the anatomical discoveries and experiments of Professor Owen.

The shell of Carinaria may be described as being conical, cap-shaped, very thin, hyaline, and somewhat compressed at the sides; the vertex is very much attenuated, and is inflected into a very minute heliciform spire, exhibiting the formation of the shell in embryo; the back is furnished with a keel, composed of two distinct laminæ, belonging as it were to each half of the shell, and it is either simple or dentated, in a direct ine from the vertex to the aperture; the aperture is oblong, very large and entire. There is no appearance of any muscular impression.

The Carinariæ are very abundant in the Mediterranean and Indian Seas; they swim about in numbers together, but are seldom to be seen except at night.

Examples.

Pl. CLVIII. Fig. 1 and 2.

Carinaria Mediterranea, Sowerby, Genera of Shells, No. 34.

Pl. CLVIII. Fig. 3 to 5.

Carinaria gracilis*, *Nobis*, Annals and Mag. Nat. Hist., April 1842.

* This magnificent shell is in the collection of the Rev. Mr. Stainforth.

Order VI. GASTEROPODA PULMOBRANCHIATA.

Branchiæ per aërem tantum respirantes, retem vascularem in cavitate dorsali formantes; pallio suprà cavitatem sæpissimè perforato, orificio valvâ carneâ instructo.

This order includes the whole of the pulmoniferous or *air-breathing* Mollusca. Their respiratory organs form a kind of vascular network, somewhat analogous to that in the Mammalia, lining a cavity in the back, whilst the mantle is generally perforated in that part which covers it, the orifice being furnished with a small fleshy valve, which the animal opens and shuts at will. The greater part of the Pulmobranchiate Gasteropoda are terrestrial; some, however, are aquatic; they live in water, but are compelled to rise to the surface in order to breathe air; at some seasons of the year they are constantly floating upon the surface of stagnant waters; at others again they sink, and are supposed to have the power of suspending their respiration for a considerable time. Cuvier established two separate divisions for these animals, the *Pulmonés terrestres*, and the *Pulmonés aquatiques*; some of these animals, however, cannot positively be referred to either, for though not aquatic they are not strictly terrestrial, as they can only subsist in wet and marshy places; some indeed are amphibious.

We divide the Pulmobranchiata into five families, as follows:

Limacinea.	Auriculacea.
Colimacea.	Lymnæana.
Cyclostomacea.	

Family 1. LIMACINEA.

Testa parva, aut externa, aut interna, simplex, interdum subspiralis, corpori affixa, vel ad partem anticam, vel posticam, vel mediam.

The family of the Limacinea are placed at the commencement of the great series of pulmoniferous or air-breathing mollusks, because of their leading characters being considered as intermediate between those of the *Aplysiæ* and the *Helices*. They may be said to resemble the former, to a certain extent, as regards the nature and purpose of their shell, namely, that of affording protection to the respiratory cavity; and the latter altogether, in their general organization and habits. The breathing apparatus of this family varies considerably in its position: in some it is situated at the anterior part of the body; in others at the posterior; and in others again in the middle; whilst the shell which covers it, being external or internal, is either simple or spiral.

The Limacinea are for the most part to be found buried in damp earth, and live upon worms and various kinds of vegetable matter; they may be divided into four genera, as follows:

PARMACELLA.	TESTACELLUS.
LIMAX.	VITRINA.

PARMACELLA, Cuvier.

Testa interna, subcochleariformis, epidermide corneâ induta, in scutello mediano inserta, spirâ brevissimâ, interdum papilliformi, basi coarctatâ; spiræ aperturâ minimâ, labio externo subirregulari, expansissimo.

The genus Parmacella was instituted by Cuvier for the reception of a

newly discovered mollusk, allied to the *Limax* or common slug; but instead of having its shell inserted near the neck, it is situated about the middle of the back, enclosed in a small fleshy scutellum as in that genus.

It may be described as being internal, somewhat spoon-shaped, enclosed within a fleshy shield situated towards the middle of the animal, and covered with a horny epidermis; the spire is very short, sometimes papilliform, and is contracted at the base; the aperture of the spire is very small; the outer lip is somewhat irregular, and widely expanded.

Example.

Pl. CLIX. Fig. 1 to 3.

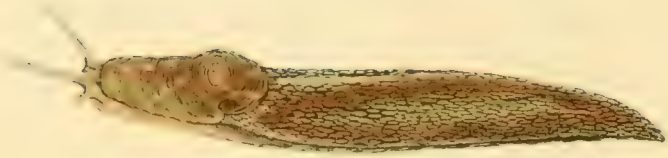
PARMACELLA CALYCULATA, Sowerby, Genera of Shells, No. 13. D'Orbigny, Moll. des Iles Canaries, p. 50. pl. 1. fig. 1 to 12.
Testacellus ambiguus, De Férussac.
Cryptella ambigua, D'Orbigny.
Cryptella Canariensis, Webb and Berthelot.

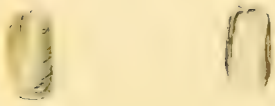
LIMAX, Linnæus.

Testa interna, subirregularis, subquadrata, planulata, calcareo-crystallina, in scutello antico inserta; epidermide tenui, ultra margines laterales paululùm reflexâ; vertice subretuso; spirâ nullâ.

The Limaces or garden slugs, a genus of mollusks with which most people are familiar, appear to have been mentioned in the earliest records of natural history; but the discovery of their being sometimes provided with an internal shell is comparatively of recent date. This shell is inserted within a fleshy scutellum or shield upon the back of the neck, and may be described as being rather irregular, nearly square, smooth, and of a calcareo-crystalline composition, enclosed within a fleshy shield towards the anterior part of the animal; it is covered with a thin epidermis

Parmacella calyculata.





Limax antiquorum.

partially reflected over the sides, and the vertex is rather blunt, there being no spire.

Example.

Pl. CLX. Fig. 1 to 3.

LIMAX ANTIQUORUM, Sowerby, Genera of Shells, No. 41.

TESTACELLUS, Draparnaud.

Testa externa, subauriformis, epidermide tenui induta, ad extremitatem posticam animalis affixa; apice ferè obsoleto, brevissimè spirato; aperturâ oblongâ, amplissimâ; labio externo, integro; interno incrassato, involuto; impressione adhæsionis transversâ, lunatim oblongâ.

The *Parmacellæ*, the *Limaces*, and the Testacelli, are all closely allied by their general anatomy, but the variation in the position of the branchial cavity is curious and important. In the *Parmacellæ*, as we have already shown, it is situated about the middle of the body, and in the *Limaces* it is towards the anterior part; but in the animals which come under our present consideration, the respiratory cavity is posterior, so that the shell, which is always external in the Testacelli, is fixed as it were to the tail.

It may be described as being somewhat ear-shaped, and covered with a thin epidermis; it has a very short spiral apex, which is almost obsolete, and the aperture is of an oblong form, and very large; the outer lip is entire, the inner lip thickened, and rolled inwards; the impression which is left in the shell by its muscular attachment, is of a lunate-oblong shape.

The Testacelli are carnivorous, and feed for the most part upon earthworms.

Examples.

Pl. CLXI. Fig. 1 and 2.

TESTACELLUS HALIOTOIDEUS, Draparnaud, Hist. Nat. des Moll. Terr. et Fluv., p. 121. pl. 8. f. 43 and 48. and pl. 9. f. 12 and 13. D'Orbigny, Moll. des Iles Canaries, p. 49.
Testacella Europæa, De Roissy.

Pl. CLXI. Fig. 3 to 6.

TESTACELLUS MAUGEI, De Férussac, Moll. Terr., p. 94. pl. 8. f. 10 to 12. D'Orbigny, Moll. des Iles Canaries, p. 48.
Testacella haliotoidea, Ledru.

Pl. CLXI. Fig. 7 to 10.

TESTACELLUS SCUTULUM, Sowerby, Genera of Shells, No. 1.

VITRINA, Draparnaud.

Testa externa, rotundato-ovata, subheliciformis, tenuis, fragilis, subdepressa, epidermide viridi, nitente, induta, extremitatem posticam animalis supervolvens; spirâ brevi; aperturâ amplissimâ, semilunari, latitudine superante; margine simplici; columellâ lineari.

The genus Vitrina, instituted by Draparnaud, is one of no little importance in the distribution of this class, inasmuch as it offers a striking transition between the very types of Lamarck's grand divisions of *Gasteropoda* and *Trachelipoda*, namely, between the straight dilated form, as of *Limax*, and that which is spiral or turbinated, as of *Helix*. The Vitrinæ somewhat resemble the *Testacelli*; but instead of having a simple shell adhering to that part of the body which is the seat of the branchial

Fig. 1. & 2. Testacellus haliotideus.
3. 4. 5. 6. ....Scutulum.
7. 8. 9. 10. Maugei.

1. Vitrina pellucida.
2. . . . . Cuvieri.

cavity, the posterior extremity of the animal is enclosed within a small spiral heliciform shell, into which it can only partially retire. De Férussac regarded the Vitrinæ as being much more closely allied to the *Colimacea* than to the *Limacinea*; for in his grand distribution of the land and freshwater mollusks, he refers them to that family as forming two subgenera of *Helices*, under the new titles of *Helicolimax* and *Helicarion*, the varieties represented in our Plate.

The *Helix citrina* (subgenus *Helicella*, De Férussac) and its cognate species, which have been separated by Gray for the formation of his genus *Nanina*, are united by Quoy and Gaimard to the Vitrinæ; there is undoubtedly a strong affinity between them, but still we cannot subscribe to the union in one and the same genus of two mollusks, whose shells differ so entirely in their structure and composition.

The shell of Vitrina may be described as being rotundately ovate, somewhat heliciform, thin, fragile, rather depressed, covered with a green shining epidermis, and simply convoluted over the posterior extremity of the animal; the spire is short, and the aperture very large, semilunar, and wider than it is long; the margin is simple, and the columella linear.

Examples.

Pl. CLXII. Fig. 1.

Vitrina pellucida, Draparnaud, Hist. des Moll. Terr. et Fluv., p. 119. pl. 8. f. 34 to 37.
Helix pellucida, Muller.
Helicolimax pellucida, De Férussac.

Pl. CLXII. Fig. 2.

Vitrina Cuvierii, Sowerby, Genera of Shells, No. 11.
Helicarion Cuvierii, De Férussac.

Family 2. COLIMACEA.

Testa spirivalvis, aut turriculata, aut globosa, aut discoidea, aperturâ integrâ, labro vel simplici vel reflexo; operculo nullo, sed aperturâ interdum munimento duro, temporario, *epiphragma* dicto, inclusâ.

The family of the Colimacea or Snails commences that portion of the gasteropodous mollusks which Lamarck distinguished by the title of *Trachelipoda.* They were called *trachelipodous*, or neck-moving, because he considered the expanded disc or foot by which they acquire motion to be cervical, attached to the neck, the body being of a spiral form, enclosed within a spiral shell, moulded thereon, from which it cannot depart. The transition, however, as we have shown in our observations on the preceding genus, from the *limaciform* to the *heliciform* type, is so gradual and complete, that it is quite impossible to say where the one finishes, or the other begins; the animals of both are moreover closely allied by the similarity of their breathing apparatus. De Blainville does not even regard them as separate families; for in his 'Manuel de Malacologie' we find the Colimacea included in his family of the *Limacinea.*

The land mollusks, being naturally the first to attract the attention of naturalists, appear to have received the common appellation of snails, without reference to their many varieties of form or structure. Linnæus, indeed, was perhaps less judicious than many of his predecessors, for in his genus *Helix* he included many fluviatile and marine species as well as terrestrial. Bruguière commenced a reformation in the Linnæan *Helices* by separating the elongate varieties under the new title of *Bulimus*, and it was in a manner completed by Lamarck by the formation of the genera *Achatina*, *Pupa*, *Cyclostoma*, *Lymnæa*, *Melania*, *Auricula*, *Ampullaria*, &c. Lamarck's method is still indeed the most legitimate

distribution of this immense series; and we can adopt it, with a few additions and alterations, without following Deshayes in contracting the nomenclature, or Gray in overcharging it.

A laudable attempt has been made by De Férussac to effect an improvement in the arrangement of the Colimacea, which it may be as well to notice, both on account of its novelty and its comparative usefulness; and it would have been more generally followed than it is, were it not for the innovation which he hazarded, by the abandonment of all the names hitherto recognized, in exchange for a newly invented series of his own. The Colimacea, and a portion of the *Limacinea*, are in this arrangement included in one family, under the title of "*Les Limaçons*;" they are then divided into five genera, *Helicarion*, *Helicolimax*, *Helix*, *Vertigo*, and *Partula*; and the genus *Helix*, which includes nearly the whole of them, is distributed in the manner displayed in the following table; the subgenera corresponding to a certain extent with the genera recognized by Lamarck.

Genus.	Sections.	Subsections.	Subgenera.	Synonymous with
HELIX	REDUNDANTES. (Animal partially enclosed.)	*HELICOIDES* (Whorls rolled longitudinally.)	Helicophanta	*Helix* pars.
		COCHLOIDES (Whorls rolled vertically.)	Cochlohydra	*Succinea.*
	INCLUSÆ (Animal entirely enclosed.)	*HELICOIDES* (Whorls rolled longitudinally.)	Helicogena	*Helix* pars.
			Helicodonta	*Anostoma.*
			Helicigona	*Carocolla.*
			Helicella	*Helix* pars.
			Helicostyla	*Helix* pars.
		COCHLOIDES (Whorls rolled vertically.)	Cochlostyla	*Bulimus* pars.
			Cochlitoma	*Achatina* pars.
			Cochlicopa	*Achatina* pars.
			Cochlicella	*Bulimus* pars.
			Cochlogena	*Bulimus* pars.
			Cochlodonta	*Pupa.*
			Cochlodina	*Clausilia.*

This distribution, though clear, is certainly not well organized, for there is in reality a much stronger affinity between *Helicarion* and *Helicolimax* (*Vitrinæ*), which are regarded as different genera, than between *Cochlohydra* (*Succinea*) and *Helicigona* (*Carocolla*), which are regarded as subgenera of one and the same genus; and again, *Partula* might have been considered as a subgenus of *Helix* with just as much propriety as *Cochlogena* (*Bulimus*); the genus *Vertigo*, moreover, proposed by Müller, differs from the *Pupæ* only in the animal having two tentacula.

Perhaps there is no family throughout the system in which a more complete vein of affinity may be traced than in that of the Colimacea; we cannot therefore wonder at the many schemes that have been proposed to establish a definite form of classification. Gray divides his single family of *Helicidæ* into no less than forty-four genera; whilst Deshayes, at the same time, asserts that the *Helices* and *Carocollæ*, the *Pupæ* and *Clausiliæ*, the *Bulimi*, *Partulæ* and *Achatinæ*, should be severally united. But, as Nature will admit of no limitary line, it matters little whether we follow the first of these writers in setting the species out in tens, *to every ten a name*; or the second, in setting them out in hundreds, *to every hundred a name*; so long as we adopt whichever method is really thought most subservient to memory and convenience.

In the midst of these differences of opinion, we propose to divide the Colimacea into nine genera, distinguishing the *Auriculacea* and *Cyclostomacea*, in imitation of Gray, as separate families. The former differ in being partially aquatic, and in their shells being always strongly plaited on the columella; the latter are terrestrial, but their shells are distinguished by the rotundity of the aperture, and in being always operculated. The following are the genera into which this family is divided:

HELIX.	BULIMUS.
CAROCOLLA.	PARTULA.
ANOSTOMA.	ACHATINA.
PUPA.	SUCCINEA.
CLAUSILIA.	

HELIX, Linnæus.

Testa globosa, orbicularis, supernè convexa aut conoidea, lævigata, rarò striata, epidermide sæpissimè induta; spirâ subobtusâ, parùm elevatâ, anfractu ultimo, peripheriâ convexâ, prominentiore, umbilicum plus minusve distinctum formante; aperturâ transversâ, integrâ, intùs interdum dentatâ, marginibus disjunctis; labro vel simplici vel reflexo.

When we meet with two animals differing, however minutely, in their system of organization, presenting to all appearances a marked peculiarity of character not hitherto noticed, we conceive that each of them is in itself of sufficient importance to be regarded as the type of a particular genus, or, in other words, that each is entitled to hold its particular rank in the binominous form of nomenclature. But when a third animal is discovered, presenting an assemblage of characters exactly intermediate between those of the two previously known, partaking equally of the characters of both, the order or classification is disturbed, for the naturalist is now puzzled as to which of his two genera it should be referred. Two opinions then arise amongst authors; the one is to create a new genus specially for its reception, the other to unite the three into one; whilst neither can determine which is the artificial arrangement, which the natural.

The *Carocollæ*, the *Anostomata*, the *Pupæ*, the *Clausiliæ*, the *Bulimi*, the *Achatinæ* and the *Succineæ*, though admitted by Lamarck, as by De Férussac, to present the same system of organization as the Helices, have been separated by that author at different times according to their varieties of form or structure, upon the following argument:—that as the shell is moulded to the form of the animal, not the animal to the shell, these several diversities may, in treating of this extensive series of mollusks, be safely considered of good generic importance. After assigning

the flat discoidal varieties, wherein the periphery of the outer whorl is sharp and angular, to *Carocolla*; those in which the last whorl is turned upwards, so that the aperture rests upon the penultimate whorl, on a plane with the spire, to *Anostoma*; those of a narrow cylindrical form to *Pupa*; those of a similar form, but provided with a shelly appendage for closing the aperture, to *Clausilia*; those of an ovate or turriculated growth, with the columella simple, to *Bulimus*; and those of the same form, with the columella truncated, to *Achatina*,—there still remains a numerous assemblage of globose or conoidal varieties to the genus under consideration. We have before remarked, that there is no certain limit to any generic distribution; and in this instance there are intermediate species of *Helix* or *Carocolla*, *Pupa* or *Clausilia*, *Bulimus* or *Achatina*, and so on, that may be referred with equal propriety to either. The ingenuity of the naturalist may thus be tried in every part of the system; what end then does it serve to overcharge the nomenclature with such genera as *Omalonyx*, *Streptaxis*, *Polydontes*, *Pleurodonta*, *Dentellaria*, *Iberus*, *Chilotrema*, *Odontostylus*, *Tapada*, *Macrospira*, *Epistylium*, *Mesomphyx*, *Proserpina*, *Delomphalus*, *Hyalina*, *Abida*, *Siphonostoma*, *Acavus*, *Polygyra*, *Geotrochus*, *Zonites*, *Gibbus*, *Cionella*, and a host of others, all of which might be regarded as good sectional divisions?

The shell of Helix may be described as being globose, orbicular, superiorly convex or conoidal, smooth, seldom striated, and generally covered with an epidermis; the spire is rather obtuse, but little elevated, and the last whorl, which is more prominent, and has the circumference convex, forms a more or less distinct umbilicus; the aperture is transverse, entire, and sometimes dentated within; the margins are disjoined, and the lip is either simple or reflected.

The Helices, which are more or less distributed throughout the globe, have extraordinary powers of vitality; after being shut up in a torpid state for years, they have been known to crawl forth in full animation upon being placed upon a fresh green leaf. They have also a peculiar mode of hibernating or retiring into a state of torpidity: in the absence of an operculum the animal covers the mouth of its shell with an irregular layer of mucus, which, when hardened, forms a thin calcareous lid called

Plate CLXIII.

Plate CLXIV.

the epiphragma. When the animal again comes forth this epiphragma becomes loosened or destroyed by pressure and absorption, and is renewed as often as required.

Examples.

Pl. CLXIII. Fig. 1.

HELIX CHRYSOCHEILUS, Sowerby, Proceedings Zool. Soc., 1841, p. 3.

Pl. CLXIII. Fig. 2.

HELIX FLORIDA, Sowerby, Proceedings Zool. Soc., 1840, p. 87.
Subgenus *Cochlogena*, De Férussac.

Pl. CLXIII. Fig. 3. and Pl. CLXV. Fig. 16.

HELIX DECIPIENS, Sowerby, Proceedings Zool. Soc., 1840, p. 96.

Pl. CLXIII. Fig. 4.

HELIX FALCONARI*, *Nobis MSS.*
Helicophanta Falconari, Gray, Proceedings Zool. Soc., 1834, p. 63.

Pl. CLXIII. Fig. 5.

HELIX COLUMBARIA, Sowerby, Proceedings Zool. Soc., 1841, p. 19.

Pl. CLXIII. Fig. 6.

HELIX MERETRIX, Sowerby, Proceedings Zool. Soc., 1841, p. 20.

Pl. CLXIII. Fig. 7.

HELIX SARCINOSA, Broderip, Proceedings Zool. Soc., 1840, p. 121.
Subgenus *Cochlostyla?* De Férussac.

Pl. CLXIV. Fig. 8.

HELIX MINDANA, Sowerby, MSS. Cuming Cab.

* Mr. Gray kindly published this species some years since, at our request, in honour of David Falconar, Esq., of Edinburgh, a zealous and indefatigable conchologist.

Pl. CLXIV. Fig. 9.

HELIX COCCOMELOS, Sowerby, Proceedings Zool. Soc., 1840, p. 167.

Pl. CLXIV. Fig. 10.

HELIX INTORTA, Sowerby, Proceedings Zool. Soc., 1840, p. 168.

Pl. CLXIV. Fig. 11.

HELIX BUSBII, Gray, Annals and Mag. Nat. Hist., Dec. 1840.

Pl. CLXIV. Fig. 12 and 13.

HELIX PULCHERRIMA, Sowerby, Proceedings Zool. Soc., 1840, p. 90.

Pl. CLXIV. Fig. 14.

HELIX CEPOIDES, Lea, Trans. American Phil. Soc., vol. vii. p. 462. pl. 12. f. 14. Sowerby, Proceedings Zool. Soc., 1840, p. 88.
Subgenus *Helicostyla*, De Férussac.

Pl. CLXV. Fig. 15.

HELIX HARFORDII*, Broderip, Proceedings Zool. Soc., 1840, p. 123.

Pl. CLXV. Fig. 17.

HELIX ZONIFERA, Sowerby, MSS. Cuming Cab.

Pl. CLXV. Fig. 18.

HELIX LATITANS, Broderip, Proceedings Zool. Soc., 1841, p. 23.
Helix ferruginea, Lea.

Pl. CLXV. Fig. 19.

HELIX PAN, Broderip, Proceedings Zool. Soc., 1841, p. 23.

Pl. CLXV. Fig. 20.

HELIX LUZONICA, Sowerby, MSS. Cuming Cab.

* Named after the Rev. Augustus Harford, of Locking.

Plate CLXV.

Plate CLXVI.

Pl. CLXVI. Fig. 21 and 22.

HELIX TURBINOIDES, Broderip, Proceedings Zool. Soc., 1840, p. 123.

Pl. CLXVI. Fig. 23.

HELIX VALTONI*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXVI. Fig. 24.

HELIX FENESTRATA, Sowerby, Proceedings Zool. Soc., 1840, p. 137.

Pl. CLXVI. Fig. 25.

HELIX BALTEATA, Sowerby, Proceedings Zool. Soc., 1840, p. 136.

Pl. CLXVI. Fig. 26.

HELIX AURATA, Sowerby, Proceedings Zool. Soc., 1840, p. 100.

Pl. CLXVI. Fig. 27.

HELIX ILOCONENSIS, Sowerby, Proceedings Zool. Soc., 1840, p. 116.

CAROCOLLA, Lamarck.

Testa depressa, supernè convexa, orbicularis, epidermide plerumque induta; anfractu ultimo acutè angulato, umbilicum sæpissimè formante; aperturâ plerumque ovali, labro subangulato, reflexo, plicis infrà limbum sæpè dentato.

"It is only with the view of diminishing the immense series of *Helices*," says Lamarck, "that I propose the genus Carocolla:" the animals of both are indeed the same; but in order to facilitate the means of classifying them, the present genus may be profitably retained for those flat discoidal species in which the outer whorl of the shell is sharply angulated.

* In dedicating this remarkable species to William Walton, Esq., we memorize the name of an assiduous collector and an esteemed friend.

The shell of Carocolla may be described as being depressed, superiorly convex, and generally covered with an epidermis ; the last whorl is acutely angulated, and frequently forms a deep umbilicus ; the aperture is mostly oval ; the lip is rather angular, reflected, and often dentated within with strong plaits.

Examples.

Pl. CLXVII. Fig. 1 and 4.

Carocolla rota, Broderip, Proceedings Zool. Soc., 1841, p. 45.

Pl. CLXVII. Fig. 2.

Carocolla Reginæ, Broderip, Proceedings Zool. Soc., 1841, p. 36.

Pl. CLXVII. Fig. 3.

Carocolla labyrinthus (var.), Lamarck, Anim. sans vert., new edit., vol. viii. p. 144. De Férussac, Hist. Moll., pl. 54. B. f. 4.
Helix labyrinthus, Chemnitz.
Helix (*Helicigona*) *labyrinthus*, De Férussac.

Pl. CLXVII. Fig. 5.

Carocolla fibula, Broderip, MSS. Cuming Cab.

Pl. CLXVII. Fig. 6.

Carocolla Gualteriana, Lamarck, Anim. sans vert., new edit., vol. viii. p. 146. Chemnitz, Conch., vol. v. p. 237. vign. 44. f. A. B. C. Born. Mus., pl. 13. f. 12 and 13.
Helix Gualteriana, Linnæus.
Iberus Gualterianus, De Montford. Gray.

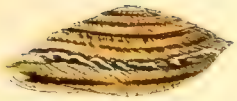
Pl. CLXVII. Fig. 7.

Carocolla parmula, Broderip, Proceedings Zool. Soc., 1841, p. 38.

Pl. CLXVII. Fig. 8.

Carocolla marginata, Lamarck, Anim. sans vert., new edit., vol. viii. p. 147. Born. Mus., pl. 14. f. 7 and 8.
Helix (*Helicigona*) *marginata*, De Férussac.

Plate CLXVII.



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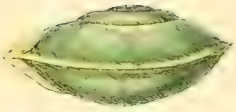

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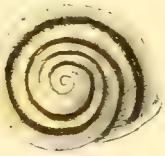

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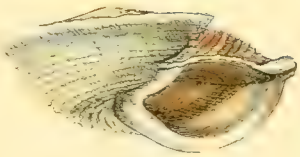

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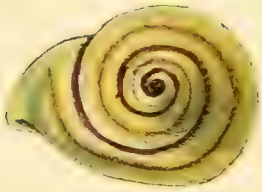

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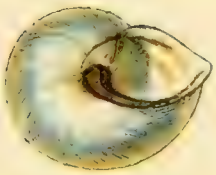

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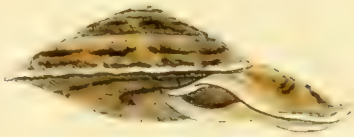

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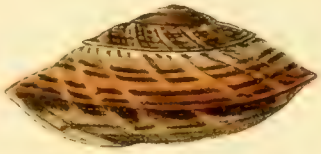

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Pl. CLXVIII. Fig. 9.

Carocolla Thersites, Broderip, Proceedings Zool. Soc., 1841, p. 38.

Pl. CLXVIII. Fig. 10.

Carocolla Dryope, Broderip, Proceedings Zool. Soc., 1841, p. 37.

Pl. CLXVIII. Fig. 11 and 12.

Carocolla Listeri, Gray, MSS. Brit. Mus. Broderip, Proceedings Zool. Soc., 1841, p. 37.

Pl. CLXVIII. Fig. 13.

Carocolla virgo, Broderip, Proceedings Zool. Soc., 1841, p. 44.

Pl. CLXVIII. Fig. 14 and 16.

Carocolla Zebuensis, Broderip, Proceedings Zool. Soc., 1841, p. 46.

Pl. CLXVIII. Fig. 15.

Carocolla Siquijorensis, Broderip, Proceedings Zool. Soc., 1841.

*ANOSTOMA**, Fischer.

Testa orbicularis, sublenticularis, spirâ obtusè convexâ, anfractu ultimo abruptè transvoluto; aperturâ semilunari, suprà spiram reversâ, utrinque intrò dentatâ; labro externè incrassato, reflexo; internè versus spiram expanso.

The Anostomata were separated from the *Helices* by Fischer on account of the very singular manner in which the last whorl of the shell is suddenly turned upwards. It is difficult to account for this extraordinary conformation; for, as Sowerby naturally observes, "does it not indicate a considerable change in the habits and economy of its animal inhabitant

* This word, compounded of ἀνὰ and στόμα, should certainly be *Anastoma*, neuter.

when arriving at maturity? Until then, it must crawl about like other snails with the spire of the shell uppermost; but during the formation of the last whorl it must suddenly take a reversed position, as in the full-grown shell the aperture appears to be on the obverse side to that in the *Helices*, namely, on a plane with the spire, which must then be undermost."

The shell of Anostoma is described as being orbicular, shaped somewhat like a lens, and its peculiarity is in having the last whorl suddenly turned upwards; the aperture is semilunar or crescent-shaped, because of the penultimate whorl projecting into its cavity, and both sides are dentated; the outer lip is thickened and reflected, and the inner lip is spread over the spire.

Examples.

Pl. CLXIX. Fig. 1.

ANOSTOMA RINGENS, Sowerby, Genera of Shells, No. 8. Chemn. Conch., vol. ix. pl. 109. f. 919, 920.

Helix ringens, Linnæus.

Anostoma depressa, Lamarck.

Tomogerus ——— ? De Montford. De Blainville.

Pl. CLXIX. Fig. 2.

ANOSTOMA GLOBULOSUM, Lamarck, Anim. sans vert., new edit., vol. viii. p. 153.

Helix (*Helicodonta*) *ringicula*, De Férussac.

PUPA, Draparnaud.

Testa oblongo-cylindracea, sæpè crassiuscula, anfractibus plurimis, plerumque transversim costellatis, umbilicum profundum interdum formantibus; aperturâ aut subquadrato-ovali, aut rotundatâ, intùs plerumque dentatâ; margine subcrasso, labro reflexo.

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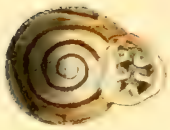

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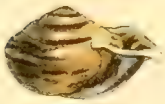

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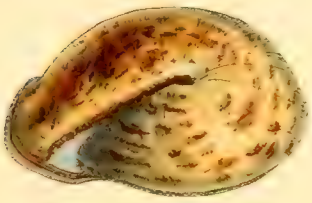


1. *Anostoma depressa*
2. ..... *globulosa*

Fig.1. Pupa Pagodus.
2. ——— Humia.
3. ——— Sulcata young.
4. ——— ———
Fig.5. Pupa Fusus.
6. ——— Maugeri var.
7. ——— truncatula
8. ——— gracilis.
Fig.9. Pupa polyodon.

There appears to have been some difference amongst authors with regard to the distribution of those species which were associated by Draparnaud under the title of Pupa. Linnæus arranged them with the *Turbines*, Bruguière with the *Bulimi*, De Férussac in his subgenus of Helices, *Cochlodonta*; and even in the present day some are for uniting them to the *Bulimi*, others to the *Clausiliæ*. They certainly run very closely into both of these genera; but inasmuch as the genus Pupa materially assists the classification of so numerous a series, we consider that it may be retained with advantage. The Pupæ may be generally distinguished by their cylindrical, turriculated form, and also by the last whorl not being enlarged.

Vertigo, a genus proposed by Müller for certain small species with only two tentacula, has been adopted by some writers; but this, again, is but a slight modification, for as the Pupæ become smaller, their two anterior tentacula gradually diminish, until at last they altogether disappear. The *Pupa elatior* of Spix, a species remarkable for the number of its volutions, has also been distinguished by Lea with the title of *Megaspira*; and the *Pupa gracilis* with its cognate species, together with several other species that are referred by some authors to the genus *Clausilia*, have been associated, on account of the margin of the aperture being continuous, and sometimes marked with a notch or groove; by Guilding under the title of *Siphonostoma*; by Pfeiffer under that of *Cylindrella*.

The shell of Pupa may be described as being of an oblong-cylindrical form, often rather thick, composed of many whorls, ribbed for the most part transversely, and sometimes forming a deep umbilicus; the aperture is either round, or subquadrately oval, and generally more or less dentated; the margin is somewhat thickened, and the lip reflected.

Examples.

Pl. CLXX. Fig. 1.

Pupa pagodus, De Férussac, Prod., p. 59. Lesson, Voyage de la Coquille, Zool., pl. 8. f. 6.

Streptaxis pagodus? Gray.

Pl. CLXX. Fig. 2.

PUPA MUMIA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 168. Martini, Conch., vol. iv. pl. 153. f. 1439, *a*, *b*.
Turbo mumia, Dillwyn.
Bulimus mumia, Bruguière.
Helix (*Cochlodonta*) *mumia*, De Férussac.

Pl. CLXX. Fig. 3 and 4.

PUPA SULCATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 170. Chemnitz, Conch., vol. ix. p. 135. f. 1231 and 1232.
Turbo sulcatus, Gmelin.
Bulimus sulcatus, Bruguière.
Helix (*Cochlodonta*) *sulcata*, De Férussac.

Pl. CLXX. Fig. 5.

PUPA FUSUS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 172. Lister, Conch., pl. 588. f. 49.
Bulimus fusus, Bruguière.
Turbo alvearia, Dillwyn.
Helix (*Cochlodonta*) *alvearia*, De Férussac.

Pl. CLXX. Fig. 6.

PUPA MAUGERI, Sowerby, Genera of Shells, No. 41.

Pl. CLXX. Fig. 7.

PUPA TRUNCATULA, Sowerby, Genera of Shells, No. 41.

Pl. CLXX. Fig. 8.

PUPA GRACILIS, Sowerby, Genera of Shells, No. 41.

Pl. CLXX. Fig. 9.

PUPA POLYODON, Draparnaud, Moll., pl. 4. f. 1 and 2. Schubert and Wagner, Supplement to Chemnitz, pl. 235. f. 4117.
Helix (*Cochlodonta*) *polyodon*, De Férussac.

CLAUSILIA, Draparnaud.

Testa elongato-turrita, fusiformis, sinistrorsa, apice obtusiusculo, anfractibus plurimis, gradatim majoribus; aperturâ irregulari, rotundato-ovatâ, plicis dentiformibus, ossiculoque testaceo sive clausio instructâ; marginibus undique connatis, labro reflexo.

The Clausiliæ are so called on account of their shells being furnished with an elastic bony appendage, attached to the columella by a slender pedicle for the purpose of closing the aperture. One or two species exhibiting this peculiarity were noticed as early as the middle of the last century by Daubenton; but Draparnaud was the first to create a new genus for their reception. Since his time several species have been referred to Clausilia, by Lamarck and others, that are entirely destitute of the clausium; Lamarck, indeed, adopts the genus upon the character of the margin of the aperture being continuous and reflected back, without reference to the presence or absence of the character by which it was originally distinguished. These have been separated by Guilding under the title of *Siphonostoma*, and by Pfeiffer under that of *Cylindrella*; but, for our own part, we think it as well to refer them to the genus Pupa, reserving the name, as originally intended by Draparnaud, for those species only that are provided with the clausium. This organ is supposed by some naturalists to be analogous to the operculum of several molluscous genera, but it is an opinion which has been contested, and we think successfully, by Gray, upon the following argument: "First, it is not attached to the animal, as the operculum always is, but is a mere appendage to the mouth of the shell. Secondly, it is only formed when the animal has reached its full growth, when it is about to complete the mouth of its shell, and not developed in the embryo of the animal while yet in the egg, as is the case with the operculum. Thirdly, the genus belongs to a group of animals which are never operculated."

The shell of Clausilia may be described as being turrited, elongated, fusiform, and always turned to the left; the spire is rather obtuse, and composed of many whorls, gradually enlarging as they are formed, the last being characterized by having a slight groove in front of the mouth forming a ridge or keel; the aperture, which is irregular and rotundately ovate, is furnished with a greater or less number of tooth-like plaits, as also with a small, elastic, shelly bone, attached to the columella; this little accessory organ is destined to close the aperture after the animal has withdrawn itself into the shell, and it again yields with the slightest pressure of the animal when it wishes to crawl forth; the margin of the aperture is continuous all round, and the lip is reflected back.

In one of our figures of the *Clausilia Macascarensis* the shell is represented with a portion of the last whorl removed, to show the *clausium*.

Examples.

Pl. CLXXI. Fig. 1.

Clausilia Macascarensis, Sowerby, Genera of Shells, No. 30.

Pl. CLXXI. Fig. 2.

Clausilia torticollis, Lamarck, Anim. sans vert., vol. viii. p. 197.
Helix (*Cochlodina*) *torticollis*, De Férussac.
Bulimus torticollis, Olivier.

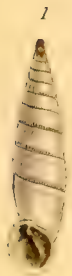
Pl. CLXXI. Fig. 3.

Clausilia labiata, Olivier. Sowerby, Genera of Shells, No. 30.
Turbo labiatus, Montague.

BULIMUS, Bruguière.

Testa ovata vel oblonga, interdum subturriculata, anfractibus plus minusve numerosis, ultimo majore; aperturâ integrâ, intùs nonnun-

Plate CLXXI.



1. Clausilia Maenscarensis.
2. tortivollis.
3. labiata Oliv.

quam dentatâ, longitudine sæpissimè superante, marginibus supernè disjunctis; labro aut simplici aut reflexo; columellâ rectâ, lævi, basi integrâ, non truncatâ, versùs marginem leviter attenuatâ.

The genus Bulimus was instituted by Bruguière for the purpose of simplifying the miscellaneous character of the Linnæan *Helices*; but in the formation of this new division he added so many species from other parts of the system, differing both in their habits and distinctive characters, that it presented nearly as anomalous an assemblage as did the very genus which it was intended to relieve. *Pupæ*, *Achatinæ*, *Lymnææ*, *Melaniæ*, *Pyramidellæ*, *Auriculæ*, &c., land, freshwater and marine, were all regarded by Bruguière as Bulimi; but since these genera have been from time to time distinguished by subsequent authors, the genus in question has retained a more natural and legitimate group. Still, in the present day, naturalists seem to differ as to the extent of its application; Deshayes, for example, takes in the *Achatinæ* and *Partulæ*, Pfeiffer the *Pupæ*, neither of which arrangements is desirable. We propose to refer to this genus all the Bulimi of Lamarck, excepting those species which have been separated by De Férussac under the title of *Partula*; we retain all the heliciform varieties, such as the *Bulimus pythogaster*, &c., which Broderip suggests might be associated under the title of *Helicobulimus*; and a few species referred by Lamarck to *Auricula*, but which have been distinguished as a new genus by Guilding and Broderip, entitled *Plekocheilus*.

The shell of Bulimus may be described as being ovate or oblong, and sometimes a little turriculated, the whorls being more or less in number, with the last always larger than the penultimate; the aperture is entire, sometimes dentated within, and generally longer than it is wide; the margins are disjoined superiorly, and the lip is either simple or reflected; the columella is straight, smooth, and entire at the base, not truncated, but attenuated towards the margin.

The Bulimi are either oviparous or viviparous; and, as a general rule, it may be noticed that in the shell of the former the lip is thickened and reflected, in the latter it is simple. It should also be mentioned, that in common with the *Pupæ* and some other mollusks, their shells often

become decollated, the first few whorls falling off in consequence of the animal having withdrawn itself from that part of the spire.

Examples.

Pl. CLXXII. Fig. 1.

BULIMUS REEVII*, Cuming, MSS.
Helix Reevii, Broderip, Proceedings Zool. Soc., 1841, p. 34.

Pl. CLXXII. Fig. 2.

BULIMUS DIANA, Broderip, Proceedings Zool. Soc., 1840, p. 157.

Pl. CLXXII. Fig. 3.

BULIMUS BOHOLENSIS, Broderip, Proceedings Zool. Soc., 1840, p. 158.

Pl. CLXXII. Fig. 4.

BULIMUS FULGETRUM, Broderip, Proceedings Zool. Soc., 1840, p. 119.

Pl. CLXXII. Fig. 5 and 6.

BULIMUS BICOLORATUS †, Lea, Trans. American Phil. Soc., vol. vii. p. 459. pl. 11. f. 8.
Bulimus Alberti, Broderip.

Pl. CLXXIII. Fig. 1.

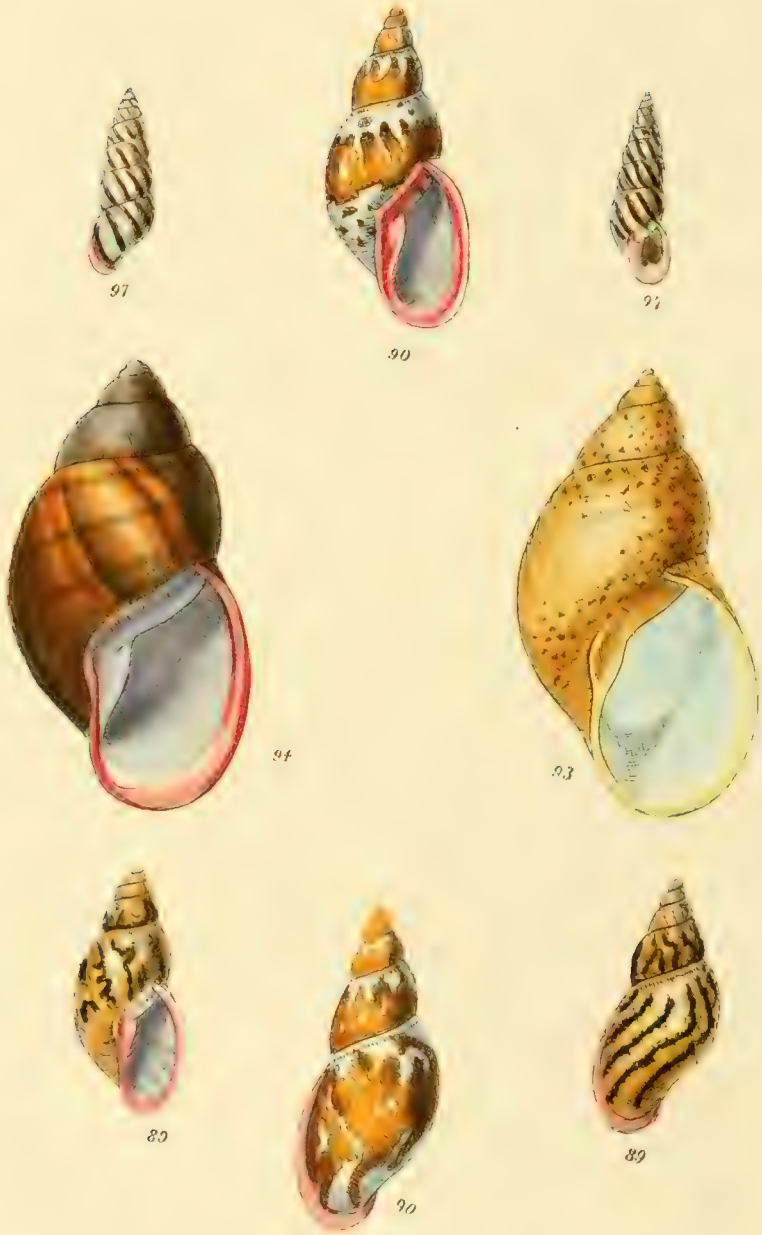
BULIMUS FICTILIS, Broderip, Proceedings Zool. Soc., 1840, p. 96. Sowerby, Jun., Conch. Illus., f. 115 and 116.

* In arranging the Colimacea after the method proposed by De Férussac, this species might be considered as the type of the new subgenus of *Helices*, suggested by Mr. Broderip, under the title of *Helicobulimus*.

† This shell was described by Lea of Philadelphia as well as by Broderip in the course of last year; and as Mr. Lea's description was exhibited at a meeting of the Zoological Society of London before that of Mr. Broderip was printed, the title of *bicoloratus* should be followed.

Plate CLXXII.

Plate CLXXIII.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Pl. CLXXIII. Fig. 2.

BULIMUS EXIMIUS*, *Nobis.*
Plekocheilus gracilis, Broderip, Proceedings Zool. Soc., 1840, p. 182.

Pl. CLXXIII. Fig. 3.

BULIMUS ONCA, D'Orbigny, Voyage dans l'Amérique Méridionale, Mollusques, p. 295. pl. 30. f. 1 and 2. Sowerby, Jun., Conch. Illus., f. 80.

Pl. CLXXIII. Fig. 4.

BULIMUS CRICHTONI, Broderip. Sowerby, Jun., Conch. Illus., f. 60.

Pl. CLXXIII. Fig. 5.

BULIMUS MINDOROENSIS, Broderip, Proceedings Zool. Soc., 1840, p. 84.

Pl. CLXXIII. Fig. 6.

BULIMUS SMARAGDINUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXIII. Fig. 7.

BULIMUS GALLINA-SULTANA, Lamarck, Anim. sans vert., vol. viii. p. 222. Chemnitz, Conch., vol. xi. pl. 210. f. 2070 and 2071.
Helix gallina-sultana, Chemnitz.
Achatina sultana, Swainson.

Pl. CLXXIV. Fig. 89.

BULIMUS MULTICOLOR, Rang, Desc. Coquilles terrestres, p. 51. pl. 3. f. 1. King, Zool. Journ., p. 341.

Pl. CLXXIV. Fig. 90.

BULIMUS MYERSII, Miller. Sowerby, Jun., Conch. Illus.

* To introduce this very delicate and beautiful species to the catalogue of Bulimi, we are compelled to change its specific name; that of *gracilis* being preoccupied by Lea.

Pl. CLXXIV. Fig. 93.

Bulimus piperitus, Sowerby, Jun., Conch. Illus.

Pl. CLXXIV. Fig. 94.

Bulimus Milleri, Sowerby, Jun., Conch. Illus.

Pl. CLXXIV. Fig. 97.

Bulimus Janeirensis, Sowerby, Jun., Conch. Illus.

PARTULA, De Férussac.

Testa ovato-oblonga, spirâ conoideâ, subobtusâ, anfractibus gradatim majoribus, ultimo subventricoso, umbilicum formante; aperturâ subquadratâ vel ovatâ, longitudine potiùs superante; margine integro, crassiusculo, labro reflexo.

The genus Partula was proposed by De Férussac for the reception of a small but interesting group of Colimacea, of which the well-known *Helix faba* of Gmelin may be regarded as the type. Lamarck included the Partulæ with the *Bulimi*; but, from a conviction that they form a very natural and well-defined series, we do not hesitate to distinguish them.

The shell of Partula may be described as being ovately oblong, with a conical and rather obtuse spire; the whorls become gradually larger, and the last, which is rather ventricose, forms an umbilicus; the aperture is somewhat square or oval, being rather longer than wide; and the margin is entire and rather thick, with the lip reflected.

Examples.

Pl. CLXXV. Fig. 1 and 2.

Partula hyalina, Broderip, Proceedings Zool. Soc., 1832, p. 32.
Bulimus hyalinus, Deshayes.

Plate CLXXV.

Pl. CLXXV. Fig. 3 and 4.

PARTULA GIBBA, De Férussac, Prod., p. 70.
Helix gibba, Quoy and Gaimard.
Bulimus gibbus, Deshayes.

Pl. CLXXV. Fig. 5 and 6.

PARTULA VARIA, Broderip, Proceedings Zool. Soc., 1832, p. 125.

Pl. CLXXV. Fig. 7 and 8.

PARTULA AURICULATA, Broderip, Proceedings Zool. Soc., 1832, p. 125.

Pl. CLXXV. Fig. 9 and 10.

PARTULA ROSEA, Broderip, Proceedings Zool. Soc., 1832, p. 125.

Pl. CLXXV. Fig. 11 and 12.

PARTULA INFLATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXV. Fig. 13 and 14.

PARTULA FABA, De Férussac, Prod., p. 66.
Limax faba, Martyn.
Helix faba, Gmelin.
Bulimus faba, Deshayes.
Bulimus australis, Bruguière.
Auris-midæ australis, Chemnitz.

Pl. CLXXV. Fig. 15 and 16.

PARTULA OTAHEITANA, De Férussac, p. 66. Lesson, Voy. de la Coquille, Zoologie, pl. 7. f. 6 and 7.
Bulimus Otaheitanus, Bruguière.
Helix Otaheitana, Dillwyn.
Helix perversa, Chemnitz.

ACHATINA, Lamarck.

Testa ovata vel oblonga, epidermide sæpissimè induta; spirâ plus minusve elevatâ; aperturâ integrâ, longitudinali, rarò suborbiculari, labro tenui, acuto, nunquam reflexo; columellâ lævi, basi truncatâ.

The Achatinæ were assigned by Linnæus to his genus *Bulla*; and Bruguière referred them to a place amongst his *Bulimi*; but although included with this extensive and miscellaneous series, they were still associated together, on account of the truncature of the columella; thus anticipating in a manner the genus which Lamarck subsequently proposed with the above title. The truncature of the columella is not, however, the only character which serves to distinguish the Achatinæ from the *Bulimi*; the margin of the aperture is invariably simple, never thickened or reflected, and a difference of habit communicates a peculiarity of appearance to the shell, by which they may always be recognised. The *Bulimi* are inhabitants of a dry soil, and live either upon the branches of trees, or clustering at the roots under the decayed and fallen leaves: the Achatinæ, on the contrary, require moisture, and are found located near wet and marshy places, in the vicinity of ponds or rivers. Still, as we are of course presented with all the intermediate modifications of these characters, nature again opposes herself to the arbitrary rules of classification; and whilst some authors have thought of diminishing the number of genera, others have laboured to increase it. Deshayes proposes to return the Achatinæ to the genus *Bulimus*; and the same arrangement is followed by Ocken, under a new title, *Pythia*. De Montford, on the contrary, has instituted two new genera out of the one under consideration; *Liguus*, from the *Achatina virginea*; and *Polyphemus*, from the *Achatina glans*.

1. *Achatina purpurea*.
2. ..... *Virginea*.
3. ..... *leucozonias*.

A removal has, however, been recently proposed by Dr. Beck, for reasons of so much consideration and importance, that the facts only require to be confirmed to be appreciated. The well-known and highly valued species, *Achatina Priamus*, is supposed by this writer to be really a marine operculated mollusk allied to *Struthiolaria*, a genus of *Pectinibranchiata*. In the absence of sufficient data confirmatory of this supposition, we have not ventured to act upon it; but if such is the case, and we think it highly probable, his genus *Priamus* should then be adopted.

The shell of Achatina may be described as being ovate or oblong, and generally covered with an epidermis; the spire is more or less elevated; the aperture is entire, longitudinal, sometimes nearly orbicular, and the lip is thin, acute, and never reflected; the columella is smooth, and truncated at the base.

Examples.

Pl. CLXXVI. Fig. 1.

ACHATINA PURPUREA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 296. Lister, Conch., pl. 581. f. 35.
Bulla purpurea, Chemnitz.
Bulimus purpurascens, Bruguière.
Helix (*Cochlitoma*) *purpurea*, De Férussac.

Pl. CLXXVI. Fig. 2.

ACHATINA VIRGINEA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 299. Lister, Conch., pl. 15. f. 10.
Helix virginea, Linnæus.
Helix (*Cochlitoma*) *virginea*, De Férussac.
Buccinum virgineum, Müller.
Bulla virginea, Chemnitz.
Bulimus virgineus, Bruguière.
Liguus ——— ? De Montford.

Pl. CLXXVI. Fig. 3.

ACHATINA LEUCOZONIAS, Sowerby, Genera of Shells, No. 14. Martini, Conch., vol. iv. pl. 148. f. 1371 and 1372.
Voluta leucozonias, Gmelin.
Helix (*Cochlitoma*) *leucozonias*, De Férussac.
Achatina albo-lineata, Lamarck.

Pl. CLXXVII. Fig. 4.

ACHATINA RICHII, *Nobis*.
Bulimus Richii, Lamarck, Anim. sans vert., new edit., vol. viii. p. 224.
Helix (*Cochlitoma*) *flammigera*, De Férussac.

Pl. CLXXVII. Fig. 5.

ACHATINA USTULATA, Lamarck, Anim. sans. vert., new edit., vol. viii. p. 297.
Helix (*Cochlitoma*) *ustulata*, De Férussac.

Pl. CLXXVII. Fig. 6.

ACHATINA LACTEA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXVII. Fig. 7 and 8.

ACHATINA REGINA, Swainson. D'Orbigny, Voy. dans l'Amérique Méridionale, pl. 29. f. 4 and 5.
Helix (*Cochlitoma*) *regina*, De Férussac.
Bulimus regina, D'Orbigny.
Fig. 7. *Achatina perversa*, Swainson.
Fig. 8. *Achatina melanostoma*, Swainson. Wagner.

Pl. CLXXVIII. Fig. 9.

ACHATINA ALABASTER, Rang, Désc. des Coquilles terrestres, p. 16. pl. 1. f. 2 and 2*a*. Deshayes, new edit. of Lamarck, vol. viii. p. 312.

Plate CLXXVII.

G.B.S. Jun

Plate CLXXVIII.

Plate CLXXIX.

G.B.S. Del.

Pl. CLXXVIII. Fig. 10.

ACHATINA PICTA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXVIII. Fig. 11 and 12.

ACHATINA FASCIATA, Swainson, Zool. Illus., vol. iii. pl. 162. Chemnitz, Conch., vol. ix. pl. 117. f. 1004 and 1006.
Buccinum fasciatum, Müller.
Helix fasciata, Gmelin.
Bulla fasciata, Chemnitz.
Bulimus vexillum, Bruguière.
Achatina vexillum, Lamarck.
Helix (*Cochlitoma*) *vexillum*, De Férussac.
Fig. 11. *Achatina crenata*, Swainson.

Pl. CLXXVIII. Fig. 13.

ACHATINA BICARINATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 296. Chemnitz, Conch., vol. ix. pl. 103. f. 875 and 876.
Bulimus bicarinatus, Bruguière.
Bulla bicarinata, Dillwyn.
Helix (*Cochlitoma*) *bicarinata*, De Férussac.

Pl. CLXXVIII. Fig. 14.

ACHATINA COLUMNARIS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 305. De Blainville, Manuel de Malacologie, pl. 40. f. 3.
Helix columna, Gmelin.
Buccinum columna, Müller.
Bulimus columna, Bruguière.
Lymnæa columna, De Roissy.
Helix (*Cochlitoma*) *columna*, De Férussac.

Pl. CLXXIX. Fig. 15.

ACHATINA ROSEA, Deshayes, Enc. Méth. vers, vol. i. p. 10.
Helix (*Cochlicopa*) *rosea*, De Férussac.

Polyphemus glans (var.), Say.
Buccinum striatum? Chemnitz.
Achatina striata, Deshayes (in new edit. of Lamarck).

Pl. CLXXIX. Fig. 16.

ACHATINA DACTYLUS, Broderip, Proceedings Zool. Soc., 1832, p. 32.

Pl. CLXXIX. Fig. 17.

ACHATINA ZEBRA (var.), Lamarck, Anim. sans vert., new edit., vol. viii. p. 295. Chemnitz, Conch., vol. ix. pl. 118. f. 1014.
Buccinum achatinum (var.), Müller.
Bulla achatina, Born.
Bulla zebra, Chemnitz.
Bulimus zebra, Bruguière.
Helix (Cochlitoma) zebra, De Férussac.

Pl. CLXXIX. Fig. 18.

ACHATINA TINCTA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXIX. Fig. 19.

ACHATINA KRANSII, *Nobis*, Proceedings Zool. Soc., 1842.

SUCCINEA, Draparnaud.

Testa fragilis, ovata vel ovato-conica, spirâ parvâ, subacutâ; aperturâ amplâ, integrâ, longitudinali, marginibus disjunctis; labro acuto, non reflexo; columellâ lævi, angustâ, versus marginem attenuatâ.

The *Helix putris* of Linnæus, distinguished as a genus by Draparnaud under the title of Succinea, appears to have been long known to naturalists; indeed, from its being abundantly found in wet and marshy places in nearly every part of Europe, it was amongst the first of the Colimacea

1 *Succinea cucullata.*
2 *. obtusa.*
3 *amphibia*

that attracted their attention. Lamarck soon discovered the necessity of separating the Succineæ from the *Helices*: from the fact of their living upon the banks of stagnant waters, he considered them to be amphibious, intermediate in their organization between the *Bulimi* and the *Lymnææ*, and the title under which he proposed to distinguish them was that of *Amphibulina*. Draparnaud, however, claimed priority, and Lamarck at length consented to abandon the appellation of *Amphibulina* for that of Succinea, although both of these generic terms are now used by some writers in reference to different varieties.

The shell of Succinea may be described as being fragile, and ovate or ovately conical, with a small spire; the aperture is large, entire and longitudinal, with the margins disjoined; the lip is acute, not reflected, and the columella is smooth, narrow, and attenuated towards the margin.

Examples.

Pl. CLXXX. Fig. 1.

Succinea cucullata, Lamarck, Anim. sans vert., new edit., vol. viii. p. 315. De Férussac, Hist. Moll., pl. 11. f. 14 to 16; and pl. 11 *a*. f. 12 and 13.

Amphibulina cucullata, Lamarck (Ann. du Mus.).

Bulimus patulus, Bruguière.

Helix (*Cochlohydra*) *patula*, De Férussac.

Pl. CLXXX. Fig. 2.

Succinea obtusa, Sowerby, Genera of Shells, No. 9.

Pl. CLXXX. Fig. 3.

Succinea amphibia, Draparnaud, Hist. Moll. terr. et fluv., pl. 3. f. 22 and 23. Chemnitz, Conch., vol. ix. pl. 135. f. 1248.

Helix putris, Linnæus.

Helix succinea, Müller.

Bulimus succineus, Bruguière.

Turbo trianfractus, Da Costa.

Family 3. CYCLOSTOMACEA.

Testa aut globosa, aut turrita, aperturâ rotundâ, vel semilunari, labro plerumque reflexo, canali aut fissurâ propè ad marginem interdum inciso. Operculum vel corneum, vel calcareum.

We propose to establish this family for the purpose of associating together in one group the operculated pulmoniferous Gasteropoda, the greater part of which are terrestrial. Lamarck included all those that were known to him with the *Colimacea*, but the necessity for distinguishing them is obviously founded upon the important difference of their being furnished with an operculum. Gray has subdivided this portion of the class into no less than three families, *Truncatellidæ*, *Cyclostomidæ*, and *Helicinidæ*; and the first of these is entirely removed from the others, upon the supposition that they are pectinibranchial water-breathing mollusks, incapable of existing in air: we do not however think that such is the case, nor do we see that our position is at all negatived by the experiments of Mr. Lowe. De Blainville, again, for reasons unknown to us, has widely separated the *Cyclostomata* from the *Helicinæ*, although the only author who ventures to dispute their close affinity: the first of these genera is referred to his family of the *Cricostomata*, between the *Valvatæ* and the *Paludinæ*; the latter to that of the *Ellipsostomata*, after the *Ampullariæ*, which, as strangely, follow the *Phasianellæ*.

The shell of the Cyclostomacea varies exceedingly in form, being either globose or turrited; the aperture is round or semilunar, and the lip, which is generally reflected, is sometimes indented near the columella with a canal or fissure. The operculum, which is common to all, is either horny or subcalcareous.

We divide this family into four genera:

Pupina.	Cyclostoma.
Truncatella.	Helicina.

PUPINA, Vignard.

Testa cylindracea, subturrita, luculenter polita, spirâ plus minusve depressâ, apice obtuso; anfractibus quinque ad sex, penultimo inflato, ultimo paululùm coarctato; aperturâ circulari, marginibus disjunctis, labro incrassato, subreflexo, canali aut fissurâ infundibuliformi propè ad columellam plerumque inciso. Operculum corneum, orbiculare, spirale.

The genus Pupina, which is comparatively but little known to collectors, was proposed some years since by Vignard for the reception of a solitary species, supposed to have been found upon the bank of a lake or river in New Guinea: another was subsequently discovered by Grateloup, and he also, in determining its claim to the formation of a new genus under the title of *Moulinsia*, was struck by the peculiarities of the shell, probably without being aware that it had already excited the attention of Vignard. The Pupinæ were considered by Grateloup to partake of the characters of the *Pupæ*, the *Cyclostomata*, and the *Helicinæ*; De Férussac hazarded an opinion that they were allied to the *Planaxes* or the *Buccina*: the views of the first of these authors were however subsequently confirmed by Gray, upon discovering that these little mollusks are pulmoniferous and operculated. A funnel-shaped marginal canal or slit, which may be seen in most of the species near the columella, is evidently analogous to that in the shell of *Helicina*, but, like the slit in that genus, it is sometimes filled up, and cannot therefore be relied upon as a distinguishing character: Gray, nevertheless, proposes to distinguish such of the Pupinæ as exhibit the marginal fissure, by the new generic title of *Callia*.

The shell of Pupina may be described as being cylindrical, somewhat turrited, and highly polished, the spire being more or less depressed, and rather obtuse at the apex: it is composed of about five or six whorls, the

last but one is unusually inflated, and the last a little contracted; the aperture is circular, with the margins disjoined; the lip thickened, a little reflected, and generally cut or graved near the columella with a small funnel-shaped canal or fissure. The Pupinæ are furnished with a horny, orbicular, spiral operculum*.

Examples.

Pl. CLXXXI. Fig. 1 and 2.

PUPINA VITREA, Sowerby, Jun., Proceedings Zool. Soc., 1841; Thesaurus Conchyliorum, pl. iv. f. 6 and 7.

Pl. CLXXXI. Fig. 3 and 4.

PUPINA SIMILIS, Sowerby, Jun., Proceedings Zool. Soc., 1841; Thesaurus Conchyliorum, pl. iv. f. 4 and 5.

Pl. CLXXXI. Fig. 5 and 6.

PUPINA NUNEZII, Sowerby, Jun., Proceedings Zool. Soc., 1841; Thesaurus Conchyliorum, pl. iv. f. 8 to 11.
Moulinsia Nunezii, Grateloup.

Pl. CLXXXI. Fig. 7 and 8.

PUPINA HUMILIS, Jaquenot, Annales des Sciences Naturelles, 1841. Sowerby, Jun., Thesaurus Conchyliorum, pl. iv. f. 2.

Pl. CLXXXI. Fig. 9 and 10.

PUPINA LUBRICA, Sowerby, Jun., Proceedings Zool. Soc., 1841. Thesaurus Conchyliorum, pl. iv. f. 12 to 16.
Callia lubrica (?), Gray.

* The genus Pupina, of which so little is at present known, has been judiciously selected by Mr. G. B. Sowerby, Jun., for publication in the first Part of his 'Thesaurus Conchyliorum.' The object of this work is to give a complete monograph of every genus; and we sincerely hope that the author will meet with sufficient encouragement to enable him to furnish that greatest of all desiderata—a well-illustrated Catalogue of Species.

Plate CLXXXI.

TRUNCATELLA, Risso.

Testa turriculata, cylindrica, apice decollato aut truncato-obtuso, anfractibus vel lævibus, vel transversè costatis; aperturâ ovali, brevi, peritremate continuo; labro simplici. Operculum ovale, subspirale.

The genus Truncatella was proposed by Risso for the purpose of distinguishing the *Cyclostoma truncatulum* of Draparnaud, on account of the difference which he discovered to exist in its organization and habits. The foot or organ of locomotion is in the Truncatellæ divided, as it were, into two parts, and the animal acquires motion by contracting the space between them into the form of a loop; hence they are called by Gray the Looping Snails: and in habits they differ from the *Cyclostomata* in being partially aquatic, enabled to live for a considerable time under water. The peculiarities which entitle these mollusks to the rank of a genus were noticed about the same time by the Rev. R. T. Lowe, of Madeira; for we are informed by that zealous naturalist in the 'Zoological Journal,' that upon the publication of Risso's memoir he had already distinguished them in manuscript by the title of *Erpetometra*, in allusion to their singular manner of crawling. The Truncatellæ were abundantly found by Payrandeau on the shores of the Mediterranean, and Michaud also discovered that they were aquatic: the first of these authors arranges them in his catalogue of the mollusks of Corsica with the *Paludinæ*, the latter places them with the *Rissoæ*. The genus which we have adopted cannot fail to be appreciated, and we place it amongst the pulmobranchiate Gasteropoda, presuming that the Truncatellæ are amphibious, like the *Succineæ*, an opinion of which the following experiment recorded by Lowe is almost conclusive. A specimen was taken out of the water by this gentleman on the coast of Madeira, together with several other aquatic mollusks, and they were all put away together in a dry tin box; five weeks afterwards the box was opened, and upon placing them in a glass of seawater the Truncatellæ crawled forth alive, but the other mollusks were dead.

The shell of Truncatella, of which we give magnified views, may be described as being turriculated, cylindrical, and either decollated or obtusely truncated at the apex; the whorls are smooth, or transversely ribbed, and the aperture is oval, the peritreme or margin being continuous, and the lip simple. The operculum is oval, and somewhat spiral.

Examples.

Pl. CLXXXII. Fig. 1.

TRUNCATELLA MONTAGUI, Lowe, Zool. Journ., vol. v. p. 303.
Turbo subtruncatus? Montague.

Pl. CLXXXII. Fig. 2.

TRUNCATELLA VENTRICOSA, Sowerby MSS.

Pl. CLXXXII. Fig. 3.

TRUNCATELLA CLATHRUS, Lowe, Zool. Journ., vol. v. p. 303.

Pl. CLXXXII. Fig. 4.

TRUNCATELLA STRIATA, Sowerby (J. D. C.), Philosophical Magazine.

Pl. CLXXXII. Fig. 5.

TRUNCATELLA TRUNCATULA (var. *α*.). Lowe, Zool. Journ., vol. v. p. 303.
Deshayes, Note in Edition of Lamarck, vol. viii. p. 365.
Helix subcylindrica, Montague.
Cyclostoma truncatulum, Draparnaud.
Paludina truncata, Payrandeau.
Rissoa truncata, Philippi.
Truncatella lævigata, Risso.

Pl. CLXXXII. Fig. 6.

TRUNCATELLA SCALARIFORMIS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CLXXXII. Fig. 7.

TRUNCATELLA CARIBÆENSIS, Sowerby MSS.

Plate CLXXXII.

CYCLOSTOMA, Lamarck.

Testa turbinata, varia, nunc turriculata, nunc globosa, nunc trochiformis, nunc discoidea, anfractibus rotundatis, umbilicum sæpissimè amplum formantibus; aperturâ rotundâ, marginibus plerumque connexis; labro expanso, reflexo, fimbriâ interdum ornato. Operculum vel corneum, vel calcareum, semper spirale.

The genus Cyclostoma was originally intended by Lamarck, in literal accordance with its title, to include all gasteropodous mollusks whose shells were distinguished by their having a circular mouth or aperture. This arrangement, however, was but lightly appreciated; for, in following so general a character, the terrestrial and marine kinds were indiscriminately assembled together; the *Turbo delphinus* of Linnæus being regarded as the type of the genus. Draparnaud appears to have been the first to note the manifest impropriety of associating in the same generic division, animals differing so materially in their organization and habits. The particular attention that was given by this author to the land and freshwater mollusks suggested to him the necessity of keeping them separated, and this improved method of arrangement was then recognized by Lamarck in the formation of certain new genera, which he distinguished accordingly, *Delphinula*, *Scalaria*, *Paludina*, *Valvata*, ex. gr.

If it were not that those species which are now reserved as Cyclostomata are terrestrial, air-breathing mollusks, the rotundity of the whorls, together with the peculiarity of their being furnished with an operculum, would still entitle them to a place in the family of the *Turbinacea*. And even now the policy of separating the land from the sea mollusks is questioned by some authors: De Blainville, for example, appears to give little or no attention to this important difference in the respiratory system; the genera *Turbo* and *Cyclostoma* being arranged by this author in one and the same family, *Cricostomata*.

We do not say that a complete boundary line can be marked out between the land and freshwater mollusks, for Nature presents us with intermediate modifications of habit, as well as of form or growth; many, for instance, are amphibious, living on the sea-shore, like the *Truncatellæ* among the *Cyclostomacea*, or on the banks of ponds and ditches, like the *Succineæ* among the *Colimacea*; others again, like the *Ampullariæ* among the *Peristomata*, located in marshy places where the water is occasionally dried up, are found to possess, by a liberal contrivance of Nature, a double system of respiration—an *air-breathing* system by means of a pulmonary cavity, and a *water-breathing* system by means of branchiæ;—what we assert is this,—that where the difference of habit is as clearly defined as between the *Cyclostomata* and the *Turbines*, a distinctive limit ought to be observed in the classification, or, in fact, wherever it may be done with accuracy, and without injury to the system. Variation of habit in the mollusk involves a corresponding variation in the nature and composition of the shell; the difference between the influence of air and that of water, and the difference of food, produce a corresponding change in the composition of the calcareous mucus which is exuded for its formation. Land shells are light, and never pearly or enamelled; sea shells, on the contrary, are for the most part heavy, and generally pearly or enamelled; in fact, the appearance of a shell always indicates, to a certain extent, whether its animal inhabitant is terrestrial or marine.

We would refer, then, to the present genus all the round-mouthed operculated species that are really terrestrial, including those varieties which have been separated under the title of *Pterocyclos*, because of the outer lip being furnished with an arched wing adhering to the penultimate whorl (Benson, Asiatic Journ., Jan. 1832), as well as those which have been distinguished by the appellation of *Megalomastoma*, on account of a ridge or groove in the front of the mouth, near the pillar.

The shell of Cyclostoma may be described as being turbinated, and varying considerably in the arrangement of the whorls; it is for the most part globose, but often turriculated, trochiform, or discoidal; the whorls are round, and in their volution generally form a large umbilicus; the aperture is also round, with the margins generally connected; the lip

Plate CLXXXIII

is expanded and reflected, and sometimes ornamented with a frill. The operculum is either horny or calcareous, and always spiral.

The Cyclostomata are exceedingly numerous in species; they live for the most part in the vicinity of lakes or rivers, and are more or less distributed throughout the globe; the more beautiful varieties of form or colour abounding in warm and tropical regions*.

Examples.

Pl. CLXXXIII. Fig. 1.

CYCLOSTOMA SEMILABRUM, Lamarck, Anim. sans vert., new edit., vol. viii. p. 357. Delessert, Recueil de Coquilles, pl. 29. f. 1. *a*, *b*.

Pl. CLXXXIII. Fig. 2.

CYCLOSTOMA NITIDUM, Sowerby, Proceedings Zool. Soc., 1842.

Pl. CLXXXIII. Fig. 3.

CYCLOSTOMA GONIOSTOMA, Sowerby, Proceedings Zool. Soc., 1842.

Pl. CLXXXIII. Fig. 4.

CYCLOSTOMA OBSOLETUM, Lamarck, Anim. sans vert., new edit., vol. viii. p. 355. Delessert, Recueil de Coquilles, pl. 29. f. 11. *a*, *b*, *c*.

Pl. CLXXXIII. Fig. 5.

CYCLOSTOMA FIMBRIATULUM, Sowerby, Appendix to Tankerville Catalogue, p. viii.; Species Conchyliorum, Part 2. f. 136.

Pl. CLXXXIII. Fig. 6.

CYCLOSTOMA STAINFORTHII, Sowerby, Proceedings Zool. Soc., 1842.

* Mr. Sowerby has kindly permitted us to refer to his figures of *Cyclostomata* in Part 2. of the 'Species Conchyliorum,' which we are happy to announce is now nearly ready for publication. The beautifully illustrated monograph of this genus, upon which he has been so long employed, will certainly be a most elaborate contribution to our catalogue of species.

Pl. CLXXXIII. Fig. 7.

Cyclostoma acutimarginatum, Sowerby, Proceedings Zool. Soc., 1842.

Pl. CLXXXIII. Fig. 8.

Cyclostoma ambigua, Lamarck, Anim. sans vert., new edit., vol. viii. p. 357. Delessert, Recueil de Coquilles, pl. 29. f. 5. *a*, *b*, *c*.

Pl. CLXXXIII. Fig. 9.

Cyclostoma pyrostoma, Sowerby, Species Conchyliorum, Part 2. f. 227 and 228.

Pl. CLXXXIII. Fig. 10.

Cyclostoma tigrinum, Sowerby, Species Conchyliorum, Part 2. f. 221 and 222.

Pl. CLXXXIV. Fig 11.

Cyclostoma oculus-capri, Gray, MSS. British Museum.

Pl. CLXXXIV. Fig. 12.

Cyclostoma pulchrum, Gray, MSS. British Museum. Wood, Index Testaceologicus, Suppl., pl. 6. f. 4. Sowerby, Genera of Shells, No. 35. f. 2; Species Conchyliorum, Part 2. f. 134 and 135.

Pl. CLXXXIV. Fig. 13.

Cyclostoma Harveianum, Sowerby, Species Conchyliorum, Part 2. f. 210*.

Pl. CLXXXIV. Fig. 14 and 24.

Cyclostoma Cuvierianum, Petit, Revue Zoologique, 1841, p. 184.

Pl. CLXXXIV. Fig. 15.

Cyclostoma Petiverianum, Gray, MSS. British Museum. Wood, Index Testaceologicus, Suppl., pl. 6. f. 2. Sowerby, Species Conchyliorum, f. 97 and 98.

Plate CLXXXIV.

Plate CLXXXV.

Pl. CLXXXIV. Fig. 16.

Cyclostoma filosum, Beechey's Voyage, Zoology, pl. 38. f. 31. Sowerby, Species Conchyliorum, Part 2. f. 16 and 17.

Pl. CLXXXIV. Fig. 17.

Cyclostoma giganteum, Gray, MSS. British Museum. Sowerby, Species Conchyliorum, f. 9 and 10.

Pl. CLXXXV. Fig. 18.

Cyclostoma evolutum, *Nobis*, Sowerby, Species Conchyliorum, Part 2. f. 147.

Pl. CLXXXV. Fig. 19.

Cyclostoma Cumingii, Sowerby, Species Conchyliorum, Part 2. f. 187 to 189; Proceedings Zool. Soc., 1832, p. 32. Deshayes, edit. of Lamarck, vol. viii. p. 367.

Pl. CLXXXV. Fig. 20.

Cyclostoma fulvifrons, Sowerby, Species Conchyliorum, Part 2. f. 122.

Pl. CLXXXV. Fig. 21.

Cyclostoma volvulus, Lamarck, Anim. sans vert., new edit., vol. viii. p. 353.

Helix volvulus, Müller.

Pl. CLXXXV. Fig. 22.

Cyclostoma vittatum, Sowerby, Species Conchyliorum, Part 2. f. 91 to 94.

Pl. CLXXXV. Fig. 23.

Cyclostoma cariniferum, Sowerby, Species Conchyliorum, Part 2. f. 197 and 198.

HELICINA, Lamarck.

Testa subglobosa, spirâ vel acutâ, vel depressiusculâ; aperturâ semiorbiculari, marginibus disjunctis; labro expanso, reflexo, fissurâ propè ad columellam interdum inciso; columellâ transversâ, basi callosâ. Operculum corneum, interdum subcalcareum, non spirale.

The genus we have now to consider, Helicina of Lamarck, *Oligyra* of Say, presents a very natural assemblage of characters, and has acquired no little interest amongst modern conchologists on account of the many beautiful new species that have been contributed to it by recent discoveries. Only one species appears to have been known to the early naturalists, figured by Brown in his excellent 'History of Jamaica' under the indefinite title of *Cochlea*, and by Lister amongst the *Helices*; four only are mentioned by Lamarck, but sixteen species were subsequently described by Gray in the 'Zoological Journal.' This number, however, has since increased to between seventy and eighty, described at different times by Lea, Wagner, D'Orbigny, Guilding, Sowerby, Jun., &c.; and the whole are now presented by the last of these authors in his 'Thesaurus Conchyliorum,' in the form of a well-illustrated monograph.

Gray appears to have been the first to make any mention of the anatomy of the Helicinæ; he certainly proves their affinity with the *Cyclostomata*, both in being operculated, and in having only two tentacula, and fully shows the inaccuracy of the situation to which they were assigned by Lamarck; namely, first with the *Neritæ*, and afterwards with the *Anostomata*. This opinion is not, however, sanctioned by De Blainville, nor was it indeed by Cuvier; for the Helicinæ are arranged by both these authors in another family, together with, and next in order to, the *Ampullariæ*. They undoubtedly supposed the Helicinæ to be aquatic; but D'Orbigny informs us that he found them in journeying through South America on open plains, as also upon the eastern side of the Andes,

Plate CLXXXVI.

G.B.S. Junr

though generally in damp places, not higher than two thousand *mètres* above the level of the sea. Guilding, however, says, that the species found in St. Vincent scarcely ever descend below two thousand feet above the level of the sea, and that those in Barbadoes are found in situations however exposed and dry.

Many of the Helicinæ are characterized by having a slit in the margin of the aperture at the base of the columella, like the *Pupinæ*; and Gray has considered this variation of sufficient importance to constitute the mark of a new genus, *Alcadia*; we cannot, however, appreciate its generic value, because an indication of this slit may be traced in many species where it appears to have been filled up by the last deposit of enamel.

The shell of Helicina may be described as being somewhat globose, with the spire either acute or a little depressed; the aperture is semi-orbicular, with the margins disjoined, and the lip is expanded, reflected, and sometimes indented with a slit or fissure near the columella; the columella is transverse, and callous at the base; and the operculum, which is horny, though often a little calcareous, is not spiral.

Examples.

Pl. CLXXXVI. Fig. 1.

Helicina variabilis, Wagner, Moll. du Brésil, pl. 16. f. 3 to 5. Moricand, Mém. de Genève, vol. vii. p. 448. Deshayes, edit. of Lamarck, vol. viii. p. 165.

Helicina zonata, Sowerby, Jun.

Pl. CLXXXVI. Fig. 2.

Helicina acutissima, Sowerby, Jun., Proceedings Zool. Soc., 1841. Thesaurus Conchyliorum, pl. 2. f. 92 to 95.

Pl. CLXXXVI. Fig. 3 and 4.

Helicina adspersa, Pleiffer, Wiegmann's Archives Nat. Hist., 1840. Sowerby, Jun., Thesaurus Conchyliorum, pl. 3. f. 103, 115, 124 and 125.

Helicina variegata, D'Orbigny.

Pl. CLXXXVI. Fig. 5.

HELICINA RHODOSTOMA, Gray, Zool. Journ., vol. i. p. 68. pl. 6. f. 9. Deshayes, edit. of Lamarck, vol. viii. p. 161.

Pl. CLXXXVI. Fig. 6.

HELICINA PULCHERRIMA, Lea, Trans. American Phil. Soc. Sowerby, Jun., Thesaurus Conchyliorum, pl. 1. f. 14.

Pl. CLXXXVI. Fig. 7.

HELICINA MAJOR, Gray, Zool. Journ., vol. i. p. 68. pl. 6. f. 10. Deshayes, edit. of Lamarck, vol. viii. p. 162. Sowerby, Genera of Shells, No. 36. f. 1.

Pl. CLXXXVI. Fig. 8.

HELICINA VIRIDIS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 158. Gray, Zool. Journ., vol. i. p. 67. pl. 6. f. 7. Delessert, Recueil de Coquilles, pl. 27. f. 3. *a*, *b*, *c*, *d*.

Pl. CLXXXVI. Fig. 9.

HELICINA POLITA, Sowerby, Jun., Proceedings Zool. Soc., 1841. Thesaurus Conchyliorum, pl. 2. f. 76 to 81.

Pl. CLXXXVI. Fig. 10.

HELICINA TANKERVILII, Gray, Zool. Journ., vol. i. p. 250. Sowerby, Genera of Shells, No. 36. f. 2.

Pl. CLXXXVI. Fig. 11 and 12.

HELICINA AGGLUTINANS, Sowerby, Jun., Proceedings Zool. Soc., 1841; Thesaurus Conchyliorum, pl. 2. f. 83 to 85.

Pl. CLXXXVI. Fig. 13.

HELICINA PULCHELLA, Gray, Zool. Journ., vol. i. p. 64. pl. 6. f. 1. Deshayes, edit. of Lamarck, vol. viii. p. 160.

Pl. CLXXXVI. Fig. 14.

HELICINA SAGRA, D'Orbigny, Hist. Cuba. Sowerby, Jun., Thesaurus Conchyliorum, pl. 1 and 3. f. 10 and 126.

Pl. CLXXXVI. Fig. 15.

HELICINA ANTILLARUM, Sowerby, Jun., Proceedings Zool. Soc., 1841; Thesaurus Conchyliorum, pl. 2. f. 68 to 70.

Pl. CLXXXVI. Fig. 16.

HELICINA AURANTIA, Gray, Zool. Journ., vol. i. p. 67. pl. 6. f. 8. Deshayes, edit. of Lamarck, vol. viii. p. 161.

Family 4. AURICULACEA.

Testa ovata, columellâ dentatâ, aut valdè plicatâ; aperturâ longitudinaliter ovali, labro vel incrassato vel simplici. Animal aut aquaticum, aut terrestre.

The genera which we have associated together under the above title, in imitation of De Blainville and Gray, were all included by Lamarck under the genus *Auricula* in his family of the *Colimacea*; a very numerous addition of species, however, since his time, has confirmed the propriety of separating them. The genera *Tornatella* and *Pyramidella* were at one time included in this family by the learned author of the 'Manuel de Malacologie;' but upon satisfying himself that they were hydrobranchiate or water-breathing, and moreover furnished with an operculum, he consented to remove them.

The shell of the Auriculacea is for the most part of an oval form, the columella being either dentated or strongly plaited; the aperture is longitudinally oval, and the lip is either thickened or simple, often dentated within in the same manner as the columella. The animal is either terrestrial or aquatic, and is destitute of any operculum.

We refer the following three genera to this family:

AURICULA. CHILINA.
SCARABUS.

AURICULA, Lamarck.

Testa ovata, vel ovato-oblonga, epidermide fuscâ induta; columellâ aut dentatâ, aut valdè plicatâ; aperturâ longitudinali, basi integerrimâ, marginibus subincrassatis, supernè disjunctis, labro vel simplici vel reflexo; operculo nullo.

However palpable may be the many inaccuracies which the progress of science has discovered in the general classification of Linnæus, the labours of that great naturalist must ever be commended for the order and method that originated with his 'Systema Naturæ.' Before his time it was thought for the most part sufficient to attach a specific name to each particular kind, without the necessity of establishing a form of classes, orders or genera; the type of this genus, for example, was long known to naturalists as the *Auris-Midæ*, or *Midas' Ear*. Linnæus referred the species in question to his genus *Voluta*, on account of the plaits on the columella; Müller, however, attaching a greater importance to the form and characters of the aperture, referred it to the genus *Helix*; whilst it was included by Bruguière in his heterogeneous series of *Bulimi*. Lamarck appears to be the first to have felt the necessity of establishing the present genus: in noticing that the columella of this shell was strongly plaited like that of the *Volutæ*, he did not fail to mark what a difference must exist in the organization of an animal, whose shell is characterized by the constant appearance of a special opening or canal at the base of the aperture; without taking their habits into consideration. Now the Auriculæ are all amphibious air-breathing mollusks, living either on the sea-shore, on the banks of lakes and rivers, or in fens and

marshes. We propose to include with them the genus *Pedipes*, adopted after a shell which was called by Adanson *Le Piétin*; the genus *Melampus* of De Montford, adopted by Lamarck with the title of *Conovulus*, but subsequently abandoned; the genus *Carychium* of Müller, and a few other genera introduced by Gray; and we refer such of the Lamarckian species as are inhabitants of a dry soil, *A. caprella*, *Sileni*, *leporis*, *bovina*, &c., to the genus *Bulimus*.

The shell of Auricula may then be described as being ovate, or ovately oblong, and covered with a dark brown epidermis, the columella being dentated or strongly plaited; the aperture is longitudinal, and entire at the base, without indication of any canal or sinus; the margins are somewhat thickened, disjoined superiorly, and the lip is either simple or reflected. The Auriculæ are never operculated.

Examples.

Pl. CLXXXVII. Fig. 1.

Auricula Pepita, Pfeiffer, Wiegmann's Archives Nat. Hist., 1840.
Marinula Pepita, King, Zool. Journ., vol. v. p. 344.

Pl. CLXXXVII. Fig. 2.

Auricula labrella, Deshayes, Enc. Méth. vers, vol. ii. p. 92; new edit. of Lamarck, vol. viii. p. 337; Mag. de Conch., pl. 14. f. 14.

Pl. CLXXXVII. Fig. 3.

Auricula australis, Quoy, Voy. de l'Astrolabe, vol. ii. p. 169. pl. 13. f. 34 to 38.
Melampus ovatus, Gray.

Pl. CLXXXVII. Fig. 4.

Auricula Judæ, Lamarck, Anim. sans vert., new edit., vol. viii. p. 325. Martini, Conch., vol. ii. pl. 44. f. 449 to 451.
Voluta auris Judæ, Linnæus.
Helix auris Judæ, Müller.
Bulimus auris Judæ, Bruguière.

Pl. CLXXXVII. Fig. 5.

AURICULA ANGULIFERA*, Petit MSS.

Pl. CLXXXVII. Fig. 6.

AURICULA FELIS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 326. Encyclopédie Méthodique, p. 460. f. 5, *a*, *b*.
Bulimus auris felis, Bruguière.
Voluta coffea, Chemnitz.

Pl. CLXXXVII. Fig. 7.

AURICULA CONIFORMIS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 332. Martini, Conch., vol. ii. p. 43. f. 445.
Voluta minuta, Gmelin.
Bulimus coniformis, Bruguière.
Conovulus coniformis, Bowditch.
Tornatella coniformis, De Blainville.

Pl. CLXXXVII. Fig. 8.

AURICULA MONILE, Lamarck, Anim. sans vert., new edit., vol. viii. p. 333. Martini, Conch., vol. ii. pl. 43. f. 444.
Voluta flava, Gmelin.
Bulimus monile, Bruguière.

Pl. CLXXXVII. Fig. 9.

AURICULA STAGNALIS, D'Orbigny, Voyage dans l'Amérique Méridionale, Mollusques, p. 325. pl. 42. f. 7 and 8. Magazin de Zoologie, 1835, p. 23.

Pl. CLXXXVII. Fig. 10.

AURICULA MIDÆ, Lamarck, Anim. sans vert., new edit., vol. viii. p. 323. Martini, Conch., vol. ii. pl. 43. f. 436 to 438. Quoy and Gaimard, Voy. de l'Astrolabe, vol. ii. pl. 14.

* The description of this species will shortly be published by M. Petit de la Saussaye, of Paris, who is now engaged upon a monograph of the Auriculæ.

Voluta auris Midæ, Linnæus.
Helix auris Midæ, Müller.
Bulimus auris Midæ, Bruguière.
Auris Midæ, Klein.

Pl. CLXXXVII. Fig. 11.

AURICULA LUTEA, Quoy, Voy. de l'Astrolabe, Zoologie, vol. ii. p. 163. pl. 13. f. 25 to 27. Deshayes, edit. of Lamarck, vol. viii. p. 338.
Melampus pallescens, Sowerby.

SCARABUS, De Montford.

Testa ovata, spirâ subobtusâ, anfractibus depressis, varice obsoleto utrinque notatis, ultimo interdum angulatim plicato; aperturâ ovali, intrò utrinque dentatâ, marginibus supernè disjunctis, labro simplici, subexpanso.

Amongst the many new genera that were proposed by De Montford in his 'Conchiliologie Systématique,' there are, perhaps, few more entitled to notice than that which we have here ventured to adopt; it was highly esteemed both by Lesson and De Férussac, and is for the most part acknowledged by modern authors. Without reference to the important characters in the anatomy of the Scarabi recorded by the first of these authors, there is a peculiarity attached to the shell by which it can never fail to be recognised; like the *Ranellæ*, they form half a whorl between every period of rest, leaving an obsolete varix on each side; and this is a character which we find in the shell of no other land mollusk. The typical species, which Linnæus included with the *Helices*, was amongst the number of those that were separated by Bruguière for the formation of his genus *Bulimus*; and it was subsequently removed by Lamarck to the genus *Auricula*.

The shell of Scarabus may be described as being ovate, and obtuse at the spire, with the whorls peculiarly depressed, the last being sometimes turned very abruptly to the form of an angle; the aperture is oval, and

very strongly dentated on both sides, both on the columella and within the outer lip; the margins are disjoined superiorly, and the lip is simple and a little expanded.

The Scarabi differ materially from the *Auriculæ* in their habits; they are not aquatic, nor even peculiar to marshy places, but are found under dry stones, or at the roots of trees, in woods and forests.

Examples.

Pl. CLXXXVIII. Fig. 1.

SCARABUS CLAUSUS, *Nobis*, Ann. and Mag. Nat. Hist., May 1842, p. 219. pl. 4. f. 1.
Helix clausa, Wagner.
Helix tomogera, Moricand.
Auricula clausa, Michaud.
Tomogerus clausus, Spix.

Pl. CLXXXVIII. Fig. 2.

SCARABUS TRIGONUS, Troshel, Wiegmann's Archives Nat. Hist., 1840.

Pl. CLXXXVIII. Fig. 3.

SCARABUS PLICATUS, De Férussac, Prod., p. 101. Chemn., Conch., vol. ix. pl. 136. f. 1252 and 1253.
Auricula plicata, Deshayes.

Pl. CLXXXVIII. Fig. 4.

SCARABUS UNDATUS, Lesson, Voyage de la Coquille, Zoologie, vol. ii. p. 336. pl. 10. f. 6.

Pl. CLXXXVIII. Fig. 5 and 8.

SCARABUS LESSONI, De Blainville, Dict. Sci. Nat., pl. 48. p. 32. Lesson, Voyage de la Coquille, Zoologie, vol. ii. p. 334. pl. 10. f. 4.

Pl. CLXXXVIII. Fig. 6.

SCARABUS LEKITHOSTOMA, *Nobis*, Ann. and Mag. Nat. Hist., May 1842, p. 220. pl. 4. f. 6.

Pl. CLXXXVIII. Fig. 7.

SCARABUS PETIVERIANUS, De Férussac, Prod., p. 101.
Cochlea Bengalensis, Petiver, Gazophylacia Naturæ, pl. 4. f. 10.
Auricula Petiveriana, Deshayes.

Pl. CLXXXVIII. Fig. 9.

SCARABUS STRIATUS, *Nobis*, Ann. and Mag. Nat. Hist., May 1842, p. 220. pl. 4. f. 9.
Auricula scarabæus, Quoy, Voy. de l'Astrolabe, Zoologie, vol. ii. p. 162. pl. 13. f. 24.

Pl. CLXXXVIII. Fig. 10.

SCARABUS CASTANEUS, Lesson, Voyage de la Coquille, Zoologie, p. 336. pl. 10. f. 7.

Pl. CLXXXVIII. Fig. 11.

SCARABUS IMBRIUM, De Montford, Conch. Syst. De Férussac, Prod., p. 101. Chemnitz, Conch., vol. ix. pl. 136. f. 1249 and 1250.
Helix scarabæus, Linnæus.
Helix pythia, Müller.
Bulimus scarabæus, Bruguière.
Auricula scarabæus, Lamarck.

Pl. CLXXXVIII. Fig. 12.

SCARABUS PYRAMIDATUS*, *Nobis*, Ann. and Mag. Nat. Hist., May 1842, p. 221. pl. 4. f. 12.

CHILINA, Gray.

Testa tenuis, ovata vel oblongo-ovata, epidermide viridi, maculosâ, induta; spirâ subacutâ, interdum depressiusculâ; aperturâ ovali, lon-

* For a separate notice of each of the foregoing species, we refer to our paper "On the Genus *Scarabus*," Ann. and Mag. Nat. Hist., May 1842.

gitudine superante, basi integrâ; marginibus supernè disjunctis, labro tenui, simplici; columellâ subsolidâ, acutè plicatâ.

The genus Chilina, proposed by Gray for the reception of an interesting series of pulmoniferous mollusks inhabiting the La Plata and other rivers of South America, affords us an instance in which we may safely appreciate the labours of this skilful imitator of De Montford. The first species with which naturalists were acquainted was discovered by Dombey; it was assigned by Bruguière to *Bulimus*, but Lamarck referred it to *Conovulus* (*Melampus*), a genus which he afterwards united to *Auricula*. The Chilinæ constitute a group of considerable importance in the series, because they are exactly intermediate in their organization, as well as in their habits, between the two families of the Auriculacea and the *Lymnæana*, partaking equally of the characters of both. Deshayes and D'Orbigny are of opinion that the Chilinæ are more nearly allied to the latter; we have, however, followed the arrangement of Gray, in consequence of the plait on the columella being a strong and unerring character.

The shell of Chilina may be described as being thin, ovate or ovately oblong, covered with a green, spotted epidermis, and having a rather acute spire, though sometimes a little depressed; the aperture is oval, longer than it is wide, and entire at the base; the margins are superiorly disjoined, and the lip is thin and simple; the columella is rather solid, and sharply plaited.

Examples.

Pl. CLXXXIX. Fig. 1.

Chilina robustior, Sowerby, Malac. and Conch. Mag., part 2. Sowerby, Jun., Conch. Illus.

Pl. CLXXXIX. Fig. 2.

Chilina fluctuosa, Gray, Spicilegia Zoologica, pl. 6. f. 19. D'Orbigny, Voyage dans l'Amérique Méridionale, Mollusques, p. 334. pl. 43. f. 13 to 16.

Otis fluctuosa, Humphreys.

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Pl. CLXXXIX. Fig. 3.

CHILINA AMPULLACEA, Sowerby, Malac. and Conch. Mag., part 2. Sowerby, Jun., Conch. Illus.

Pl. CLXXXIX. Fig. 4.

CHILINA GIBBOSA, Sowerby, Malac. and Conch. Mag., part 2. Sowerby, Jun., Conch. Illus.

Pl. CLXXXIX. Fig. 5.

CHILINA FLUVIATILIS, Gray, MSS. British Museum. Sowerby, Jun., Conch. Illus.

Pl. CLXXXIX. Fig. 6.

CHILINA OVALIS, Sowerby, Malac. and Conch. Mag., part 2. Sowerby, Jun., Conch. Illus.

Pl. CLXXXIX. Fig. 7.

CHILINA FLUMINEA, Gray, Spicilegia Zoologica, p. 6. D'Orbigny, Voyage dans l'Amérique Méridionale, Mollusques, p. 337. pl. 43. f. 19, 20.
Voluta fluminea, Maton.
Limneus flumineus, D'Orbigny (Mag. de Zool.).

Family 5. LYMNÆANA.

Testa tenuicula, lævigata, aperturâ sæpissimè amplâ, margine simplici, acuto, nunquam reflexo.

The Lymnæana, the *Pulmonés aquatiques* of Cuvier and De Férussac, constitute a small family of air-breathing mollusks, which, though pulmoniferous, live entirely in water. They are the chief molluscous inhabitants of ditches, fens and stagnant pools, but are compelled to rise to the surface in order to serve the purpose of respiration. They generally remain near the surface, but have the power of occasionally suspending

their respiration for a considerable time; a striking example in the economy of Nature, ministering, as it were, to the existence of such as may remain in fens or marshes, where the water is occasionally dried up. During the winter season the Lymnæana have been observed to remain under water for several months; and it has been supposed, that besides having a pulmonary cavity, they are provided with a true branchial apparatus; D'Orbigny, for example, an intelligent naturalist, who has had peculiar facilities of observing the nature and habits of the Mollusca, seems quite unwilling to admit of this suspension of the animal powers; he believes that they have the faculty of absolutely separating from the water so much air as is necessary to preserve them in their hibernacle. "En résumé, de ces deux faits, opposés en apparence, nous croyons pouvoir inférer que les animaux de cette série jouissent simultanément de la double faculté de respirer l'air en nature, au moyen d'une cavité pulmonaire, et de séparer l'air de l'eau à l'aide de branchies; au moins est-ce là ce que leur genre de vie nous force d'admettre."

The Lymnæana may be described as having a rather thin, smooth shell, the aperture of which is generally large, with the margin simple, acute, and never reflected. We divide them into three genera, as follows:

PLANORBIS.	ANCYLUS.
LYMNÆA.	

PLANORBIS, Guettard.

Testa discoidea, spirâ depressâ, apice vix prominulo, anfractibus rotundatis, utrinque conspicuis, ultimo interdum carinato; aperturâ integrâ, semilunari, marginibus disjunctis; labro aut simplici, aut incrassato, nunquam reflexo.

The genus Planorbis, founded by Guettard, a skilful conchologist cotemporary with Adanson and Linnæus, has been for the most part adopted

Plate CXC.

1. *Planorbis corneus.*
2. *Guadaloupensis*
3. ..... *carinatus.*
4. *bicarinatus.*
5. *Euomphalus*

by succeeding writers on account of the peculiar formation of the shells which it is intended to distinguish. The growth of the Planorbes is indeed very characteristic: their shells are flat and perfectly discoidal, the whorls coiling over each other upon their own axis with such regularity, that it has been almost a matter of controversy with authors to determine whether the shell is dextral or sinistral. The writers of an earlier age were so much struck with this discoidal peculiarity of growth, that they were tempted to arrange the Planorbes with the *Ammonites*; and whilst Linnæus referred them to the *Helices*, Müller laboured successfully to restore the genus that had been proposed by Guettard. Little was, however, known of the anatomy of these animals: Draparnaud, who devoted himself almost exclusively to the examination of the land and freshwater mollusks, certainly gathered from their habits that they must be in some way allied to the *Lymnææ*; but this affinity even was not fully demonstrated until the appearance of an elaborate memoir on the subject by Cuvier.

The shell of Planorbis may be described as being of a discoidal form, with the spire so depressed that the apex is scarcely prominent; the whorls are rounded, and conspicuous on both sides, the outer one being sometimes carinated; the aperture is entire, and semilunar, with the margins disjoined, and the lip is either simple or thickened, but never reflected.

Examples.

Pl. CXC. Fig. 1.

PLANORBIS CORNEUS, Draparnaud, Hist. Moll. Fluv. et Terr., pl. 1. f. 42 to 44. Chemn., Conch., vol. ix. pl. 127. f. 1116 to 1120. Encyclopédie Méthodique, pl. 460. f. 1, *a*, *b*.

Helix cornea, Linnæus.

Planorbis purpura, Müller. De Férussac.

Pl. CXC. Fig. 2.

PLANORRIS GUADALOUPENSIS, Sowerby, Genera of Shells, No. 4. Chemnitz, Conch., vol. ix. pl. 127. f. 1118.

Planorbis lugubris, Wagner. Deshayes.

Pl. CXC. Fig. 3.

PLANORBIS CARINATUS, Müller, Verm., p. 157. Draparnaud, Hist. Moll. Fluv. et Terr., pl. 2. f. 13 and 14. Encyclopédie Méthodique, pl. 460. f. 2. *a*, *b*.

Helix planorbis, Linnæus.

Planorbis acutus, Poiret.

Pl. CXC. Fig. 4.

PLANORBIS BICARINATUS, Sowerby, Genera of Shells, No. 4.

Pl. CXC. Fig. 5. (fossil.)

PLANORBIS EUOMPHALUS, Sowerby, Mineral Conchology, pl. 140. f. 7; Genera of Shells, No. 4. Deshayes, edition of Lamarck, vol. viii. p. 397.

LYMNÆA, Lamarck.

Testa oblonga vel ovata, interdum turriculata, sæpè sinistrorsa, extùs epidermide plerumque induta, nonnunquam polita; spirâ exsertâ, prominente, acutâ; columellâ tortuosâ, uniplicatâ; aperturâ amplâ, longitudinali, supernè angustatâ, marginibus disjunctis, labro simplici, tenuissimo, acuto.

In this genus we propose to include the *Physæ* and Lymnææ of Lamarck, as well as the *Aplexi* and *Amphipepleæ* of Fleming. They were arranged by Linnæus with the *Helices*, and Bruguière referred them to his genus *Bulimus*; Müller, however, distinguished them by the generic title of *Buccinum*, a name which Lamarck subsequently changed to Lymnæa, because it had been previously used by Linnæus in reference to a well-known genus of marine mollusks.

The genus *Physa* was one that Draparnaud proposed for certain sinistral varieties that are uniformly polished in consequence of the mantle being partially reflected over the margin of the aperture; this separation,

Plate CXCI.

1. *Limnea stagnalis.*
2. ..... *rufescens.*
3. *fusiformis*
4. ... *ovalis.*
5. *glutinosa*
6. ... *elongata*

however, though advocated by Lamarck, has been abandoned by Sowerby.

The shell of Lymnæa may be described as being oblong or ovate, sometimes turriculated, with the outside either polished, or covered with a dark epidermis; the spire is sharp, and generally prominent; the columella is twisted, and for the most part characterized by a single plait; the aperture is large and longitudinal, narrowed towards the upper part, the margins being disjoined, with the lip very sharp and thin.

Examples.

Pl. CXCI. Fig. 1.

LYMNÆA STAGNALIS, Draparnaud, Hist. Moll. Fluv. et Terr., pl. 2. f. 38 and 39. Turton, Manual, p. 121. f. 104.
Helix stagnalis, Linnæus.
Buccinum stagnale, Müller.
Bulimus stagnalis, Bruguière.

Pl. CXCI. Fig. 2.

LYMNÆA RUFESCENS, Gray, MSS. Sowerby, Genera of Shells, No. 7.

Pl. CXCI. Fig. 3. (fossil.)

LYMNÆA FUSIFORMIS, Sowerby, Mineral Conchology, pl. 169. f. 2 and 3.

Pl. CXCI. Fig. 4.

LYMNÆA OVALIS, Gray, MSS. Sowerby, Genera of Shells, No. 7.

Pl. CXCI. Fig. 5.

LYMNÆA GLUTINOSA, Draparnaud, Hist. Moll. Fluv. et Terr., p. 50. Turton, Manual, p. 120. f. 103.
Bulimus glutinosus, Bruguière.
Buccinum glutinosum, Müller.
Helix glutinosa, Gmelin.
Amphipeplea glutinosa, Rossmaesler.

Pl. CXCI. Fig. 6.

LYMNÆA ELONGATA, Draparnaud, Hist. Moll. Fluv. et Terr., pl. 3. f. 3 and 4. Schubert and Wagner, Supp. to Chemn. Conch., pl. 235. f. 4132 and 4133. Turton, Manual, p. 122. f. 106.

Helix octofracta, Pennant.

Helix peregrina, Dillwyn.

Bulimus leucostoma, Poiret.

Lymnæa leucostoma, Lamarck.

Pl. CXCII. Fig. 7.

LYMNÆA CASTANEA, Sowerby, Genera of Shells, No. 7. Encyclopédie Méthodique, pl. 459. f. 1. *a*, *b*.

Physa castanea, Lamarck.

Pl. CXCII. Fig. 8.

LYMNÆA FONTINALIS, Sowerby, Genera of Shells, No. 7. Chemnitz, Conch., vol. ix. pl. 103. f. 877 and 878.

Bulla fontinalis, Linnæus.

Planorbis bulla, Müller.

Bulimus fontinalis, Bruguière.

Turbo adversus, Da Costa.

Physa fontinalis, Draparnaud. Lamarck.

Pl. CXCII. Fig. 9.

LYMNÆA RIVALIS, Sowerby, Genera of Shells, No. 7.

Bulla rivalis, Dillwyn.

Physa fontinalis, *var.* Deshayes.

Pl. CXCII. Fig. 10.

LYMNÆA TURRITA, Sowerby, Genera of Shells, No. 7. Chemnitz, Conch., vol. ix. pl. 103. f. 882 and 883. *a*, *b*, *c*. Turton, Manual, p. 128. f. 113.

Bulla hypnorum, Linnæus.

Plate CXCII.

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7. *Limnea (Physa) castanea*
8. ..... *fontinalis*
9. ..... *rivalis*
10. ..... *turrita*

Planorbis turritus, Müller.
Bulimus hypnorum, Bruguière.
Bulla turrita, Gmelin.
Physa hypnorum, Draparnaud.
Physa turrita, De Férussac.

ANCYLUS, Geoffroy.

Testa tenuis, patellæformis, obliquè conica, vertice subacuto, posticè incurvo; aperturâ ovali, amplissimâ, margine undique simplici.

"It is more difficult," says Deshayes, "to determine the proper situation of the Ancyli than that of any other genus in the system." They were associated by Linnæus with the *Patellæ*; and although Geoffroy, one of the early French naturalists, is entitled to the credit of distinguishing them as a particular genus, they were still arranged in the same situation as by his contemporary. The nature and true organization of these mollusks were indeed long unknown to naturalists; they were guided, therefore, in their distribution of them by the patellæform structure of the shell. Müller, for example, adopted the genus Ancylus of Geoffroy, but still placed it in the same natural division with *Patella*; De Montford, again, referred the Ancyli to his genus *Helcion*; and even Lamarck, considering the shell of Ancylus as a modification of that of *Pileopsis*, included the genus in his family of '*Les Calyptraciens*,' though not without considerable hesitation. De Férussac appears to have been the first to notice that the Ancyli, though aquatic, are true air-breathing mollusks; he observed, that though living in water, they are compelled to rise to the surface in order to respire, like the rest of the Lymnæana, and we are indebted to our countryman Guilding for the complete history of their anatomy.

The shell of Ancylus may be described as being thin, patellæform, and obliquely conical; the vertex is rather sharp, and incurved posteriorly; the aperture is oval and very large, with the margin everywhere simple.

The Ancyli, which may be said to partake of the characters of the *Lymnææ* and the *Chilinæ*, are for the most part found in clear running streams, upon the leaves of different species of water-plants.

Examples.

Pl. CXCIII. Fig. 1.

Ancylus fluviatilis, Müller, Verm., p. 201. Draparnaud, Hist. Moll. Fluv. et Terr., pl. 2. f. 23 and 24. Turton, Manual, p. 140. f. 125.
Patella fluviatilis, Gmelin
Patella cornea, Poiret.

Pl. CXCIII. Fig. 2.

Ancylus lacustris, Müller, Verm., p. 199. Draparnaud, Hist. Moll. Fluv. et Terr., pl. 2. f. 25, 27. Turton, Manual, p. 141. f. 126.
Patella lacustris, Linnæus.
Patella oblonga, Dillwyn.

Order VII. GASTEROPODA PECTINIBRANCHIATA.

Branchiæ pectinatæ, in cavitate dorsali suprà collum impositæ; cavitate siphone aut appendice siphonali propter aquæ fluxum interdum instructâ. Animal aut phytiphagum, aut zoophagum, operculo plerumque instructum.

This order contains by far the largest portion of the Gasteropoda, and it is moreover that portion most especially esteemed by conchologists. The animals referred to it are all water-breathing mollusks, distinguished by the pectinated structure of their branchiæ, which are for the most part arranged in parallel lamellæ, like the teeth of a comb, and contained within a dorsal cavity above the neck. This cavity, necessarily requiring to be constantly supplied with the surrounding fluid, is sometimes furnished with a fleshy siphon of various length, for the influx and reflux of the water; sometimes, however, it merely takes the form of a short si-

ANCYLUS.

Plate CXCIII.

1. *Ancylus fluviatilis.*
2. *lacustris.*

phonal appendage, but the organ in either form is only found in such as are carnivorous.

The great series of Pectinibranchiate Gasteropoda may first be advantageously divided into two grand sections according to the nature of their feeding ; some being zoophagous, carnivorous or living upon flesh, others phytiphagous, or living upon vegetable food : it is an arrangement proposed by Cuvier, and adopted by most succeeding naturalists. They are all protected with solid, well-developed shells, but the zoophagous division exhibits by far the greater variety of form, colour and external development : it is only this portion of the series, too, that is provided with a siphon : they are, moreover, armed with a strong retractile proboscis, for the purpose of destroying their prey.

Twelve distinct families may then be referred to this order, dividing the flesh-eating kinds from the plant-eating kinds, as follows :

PHYTOPHAGA :	*ZOOPHAGA :*
MELANIANA.	PARASITICA.
PERISTOMATA.	CANALIFERA.
NERITACEA.	ALATA.
IANTHINEA.	PURPURIFERA.
PLICACEA.	COLUMELLATA.
TURBINACEA.	CONVOLUTA.

Family 1. MELANIANA.

Testa turriculata, columellâ interdum supernè incrassatâ, aperturâ vel integrâ, vel emarginatâ, marginibus disjunctis. Animal fluviatile, operculo corneo instructum.

The Melaniana have little affinity with the preceding family, so far as regards their system of organization, but nevertheless agree in their particular habit of being confined to fresh water : they differ essentially from

the *Lymnæana*, and are, indeed, more closely allied to some of the marine families of Gasteropoda—the *Turbinacea*, the *Canalifera*, or the *Purpurifera*: we place them, however, at the commencement of the Pectinibranchiate series, in order that the fluviatile water-breathing kinds may immediately follow the fluviatile air-breathing kinds; a decided and important change of habit, which always imparts a distinct peculiarity of character to the shell, as well as a corresponding variation in the organization of its inhabitant. We are aware that this distribution of the Melaniana, introduced by Lamarck, is opposed both to that of Gray and De Blainville; still, as we have endeavoured to establish the propriety of separating the marine from the terrestrial mollusks, so shall we attempt to show, that the same measure of distribution may be profitably observed in separating the marine kinds from the fluviatile. The *Melaniæ* are undoubtedly allied to the *Cerithia*, even in their habits, because many of them, distinguished by some authors with the title of *Potamis*, are found located in brackish water at the mouths of estuaries, or at the confluence of rivers with the sea. The *Cerithia*, however, cannot consistently be separated from the *Canalifera*, and this is an embarrassment which readily accounts for the different situations that the Melaniana have been assigned to by different authors. The two genera which are included in this family are referred by De Blainville to distant parts of the class: the one, *Melania*, to his family of *Ellipsostomata*, together with *Rissoa* and *Phasianella*; the other, *Melanopsis*, to his family of *Entomostomata*, in company with *Cerithium* and *Planaxis*. De Montford again places the genus *Melanopsis* between *Achatina* and *Terebra*; whilst it is arranged by his disciple Gray in the same family with the genera *Scalaria*, *Turritella* and *Solarium*!*

* The family *Littorinidæ* of Gray does certainly not exhibit that peculiar accuracy of distinction which usually characterizes the families of this ingenious author: it appears, indeed, to be made up of the rejectamenta of the class, for no less than fifty-five genera are assigned to it, of the most anomalous character. Are the *Paludestrinæ*, for example, rightly placed in this family? Are they more closely allied to the *Scalariæ* or the *Solaria* than to the *Paludinæ*? They are freshwater mollusks, and differ from these last only in having their eyes situated at the base of the tentacles instead of at the summit; the genus therefore, if adopted at all, should most assuredly be referred to his family of the *Paludinidæ*.

The shell of the Melaniana may be described as being turriculated, with the columella sometimes thickened at the upper part; the aperture is either entire or emarginated, and the margins are disjoined. The animal is strictly fluviatile, and furnished with a horny operculum.

We refer the following two genera to this family:

MELANIA. MELANOPSIS.

MELANIA, Lamarck.

Testa turrita, vel subturrita, externè sæpissimè rugifera, aut nodulosa, epidermide fusco-nigrâ plerumque induta; spirâ interdum brevissimâ, apice sæpè valdè eroso; columellâ lævi, incurvâ; aperturâ integrâ, vel ovatâ, vel oblongo-ovatâ, suprà acutâ, infrà canali indistincto interdum sinuatâ, labro simplici, acutiusculo. Operculum corneum, spirale.

The genus Melania was founded by Lamarck for the reception of a group of freshwater Pectinibranchiata, which have a dark solid turriculated shell, somewhat like that of the marine *Cerithia*, arranged by Linnæus with the *Helices*, and by Bruguière with the *Bulimi*. They differ essentially from the *Lymnææ*, inasmuch as they breathe only in water: their places of habitation are also distinct; the *Lymnææ* inhabit fens, ditches and shallow pools, but the Melaniæ are found located in rivers, lakes and rapid streams; their shells, which are altogether more solid and calcareous, exhibit for the most part that dark dingy colour which more or less characterizes the shells of all fluviatile mollusks, and, like the rest of them, are generally more or less eroded. Some that have been referred to this genus by authors, must, however, be removed, if only on account of their being marine; the *Melania nitida*, for example, which has been selected for the formation of the genus *Eulima*, and the *Melania cochlearella* for the genus *Rissoa*. The many varieties of Melaniæ that have been discovered in the great rivers of America have induced the concho-

logists of that country to propose several new genera; one, for instance, by Lea under the title of *Io*, and another by Say under that of *Anculotus*, both of which may be esteemed as good and important sections of the genus under consideration.

The shell of Melania may be described as being more or less turrited, having the outside generally wrinkled or nodulous, and for the most part covered with a blackish brown epidermis; the spire is in some instances very short, and in most cases more or less eroded at the summit; the columella is smooth, and curved inwards; the aperture is entire, ovate, or oblong, sharp above, and occasionally sinuated with an indistinct canal beneath; and the lip is simple and rather sharp. The operculum is horny and spiral.

Examples.

Pl. CXCIV. Fig. 1.

MELANIA AMARULA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 431. Encyclopédie Méthodique, p. 458. f. 6. *a*, *b*.

Helix amarula, Linnæus.

Buccinum amarula, Müller.

Bulimus amarula, Bruguière.

Pl. CXCIV. Fig. 2.

MELANIA VARIABILIS, Benson, Asiatic Journal, August 1835.

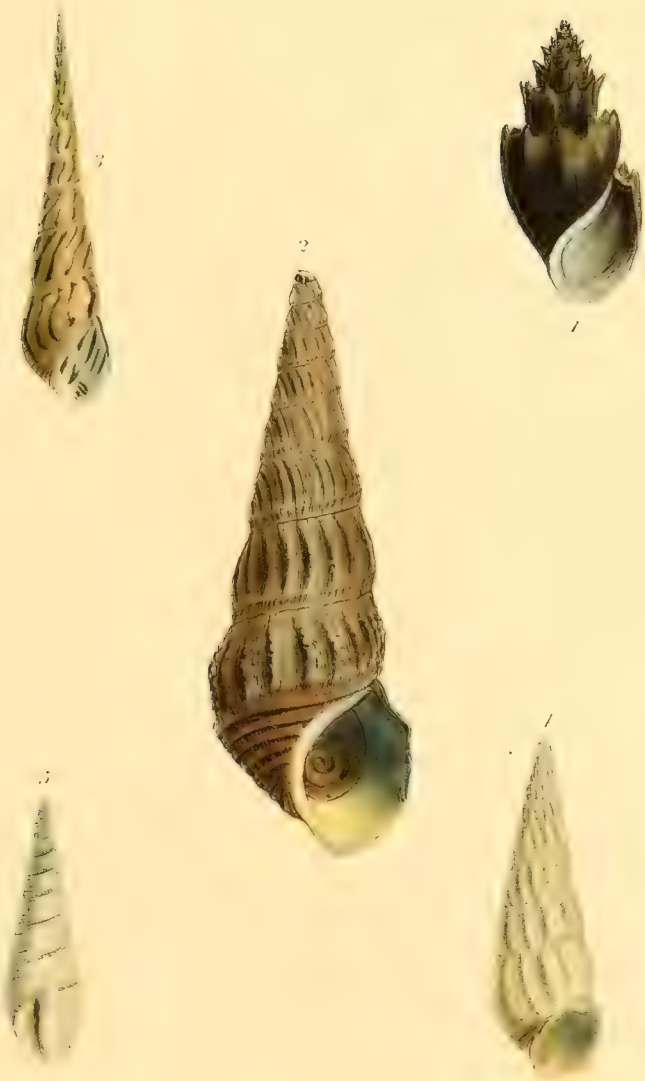
Pl. CXCIV. Fig. 3.

MELANIA SUBULATA, Sowerby, Genera of Shells, No. 22.

Pl. CXCIV. Fig. 4. (fossil.)

MELANIA COSTELLATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 444. Ann. du Mus., vol. iv. p. 430, and vol. viii. pl. 60. f. 2. Deshayes, Désc. des Coquilles fossiles, vol. ii. p. 113. pl. 12. f. 5, 6, 9 and 10.

Melania variabilis, Defrance.



1. *Melania Amarula*
2. *subulata*
4. *costellata*
5. *maculata*

Pl. CXCIV. Fig. 5. (fossil.)

MELANIA MARGINATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 445. Ann. du Mus., vol. iv. p. 130, and vol. viii. p. 60. f. 4. Deshayes, Désc. des Coquilles fossiles, vol. ii. p. 114. pl. 14. f. 1 to 4.
Bulimus turricula, Bruguière.

MELANOPSIS, Lamarck.

Testa fusiformis, vel conico-cylindracea, epidermide nigerrimâ interdum induta; apice acuto, sæpè decorticato; columellâ lævi, supernè sæpè incrassatâ, infernè subtruncatâ; aperturâ oblongâ, suprà acutâ, nonnunquam subcanaliculatâ, infrà profundè emarginatâ; labro paululùm reflexo. Operculum corneum, spirale, parvum.

The Melanopsides were separated by Lamarck from the *Melaniæ*, for the same reason that induced him to distinguish the *Achatinæ* from the *Bulimi*, namely, on account of a truncature of the columella. He then proposed another genus, *Pirena*, for such of them as exhibit a swollen callosity on the upper part of the columella, and have the upper portion of the aperture emarginated with a sinus as well as the lower. The value of this distinction has, however, been long ago nullified by the discovery of intermediate variations of growth; the genus *Pirena* was abandoned first by De Férussac, afterwards by Sowerby, and we see no necessity for reviving it. The basal sinus, an indication of which may be traced in many of the *Melaniæ*, is very characteristic in the Melanopsides, and accounts for the early naturalists having associated these shells under the significant title of the freshwater *Buccina*; whilst Linnæus, for the same reason, referred the well-known *Melanopsis atra* to his genus *Strombus*.

The shell of Melanopsis may be described as being either fusiform or conically cylindrical, and generally covered with a very black epidermis; the apex is sharp, but often decorticated; the columella is smooth, often

thickened towards the upper part, and more or less truncated at the lower; the aperture is generally oblong, acute and sometimes canaliculated above, and deeply sinuated below; the lip is a little reflected, and the operculum is horny, spiral and small.

Examples.

Pl. CXCV. Fig. 1.

MELANOPSIS ATRA, De Férussac, Monographie des Mélanopsides, Mém. de la Société d'Hist. Nat. de Paris, p. 161. Quoy and Gaimard, Voy. de l'Astrolabe, pl. 56.

Strombus ater, Linnæus.

Nerita atra, Müller.

Strombus atro-purpureus, Schroeter.

Strombus dealbatus, Gmelin.

Buccinum acicula, Gmelin.

Cerithium fluviatile, De Férussac.

Pl. CXCV. Fig. 2.

MELANOPSIS BUCCINOIDES, De Férussac, Monog. des Mélanopsides, Mém. de la Soc. d'Hist. Nat. de Paris, vol. i. p. 148. pl. 7. f. 1 to 11, and pl. 8. f. 1 to 4.

Buccinum prærosum, Linnæus.

Melania buccinoidea, Olivier.

Melanopsis lævigata, Lamarck.

Pl. CXCV. Fig. 3.

MELANOPSIS COSTATA, De Férussac, Monog. des Mélanopsides, Mém. de la Soc. d'Hist. Nat. de Paris, vol. i. p. 156. pl. 7. f. 14 and 15. Encyclopédie Méthodique, pl. 458. f. 7.

Melania costata, Olivier.

Pl. CXCV. Fig. 4.

MELANOPSIS ACICULARIS, De Férussac, Monog. des Mélanopsides, Mém. de la Soc. d'Hist. Nat. de Paris, vol. i. p. 160.

Melanopsis Audebardii, Prévost.

1. *Melanopsis atra*
2. ..... *buccinoides*
3. ..... *costata*.
4. ..... *acicularis*
5. ..... *fusiformis*

Pl. CXCV. Fig. 5.

MELANOPSIS FUSIFORMIS, Sowerby, Genera of Shells, No. 22.
Melanopsis buccinoides (*var.*), Deshayes.

Family 2. PERISTOMATA.

Testa globosa, vel subturrita, epidermide olivaceâ induta, aperturâ ferè rotundâ, margine continuo. Animal fluviatile, operculo aut corneo, aut calcareo.

The Peristomata are distinguished more by the similarity of their habit as living in fresh water than by any great similitude in their system of organization. It is, indeed, somewhat varied in these animals, though merely modified to the different necessities of their habits; like the *Melaniana*, they have been variously distributed by authors, and we have not adopted the arrangement of Lamarck without some hesitation. The variation of character we allude to is in the *Ampullariæ*, which exhibit a peculiarity of contrivance in their breathing apparatus found in no other mollusk. Being for the most part inhabitants of shallow stagnant pools, where the water is occasionally dried up, they are provided for this emergency by a double system of respiration, both a water-breathing, and an air-breathing system. By this arrangement they are preserved, and thus enabled to live a long time out of their natural element.

The shell of the Peristomata may be described as being globose, or somewhat turrited, and covered with a dark olivaceous epidermis; the aperture being generally round, with the margin continuous. The animal is fluviatile, and furnished with an operculum, which is either horny or calcareous.

Three genera are referred to this family, as follows:

VALVATA. AMPULLARIA.

PALUDINA.

VALVATA, Müller.

Testa spiralis, spirâ discoideâ, vel elevatiusculâ, anfractibus rotundis, convexis, ultimo umbilicum amplum formante; aperturâ circulari, margine continuo, labro simplici, acuto. Operculum corneum, spirale.

The shell of this little mollusk, distinguished by Müller with the title of Valvata, appears to have been first noticed by Geoffroy; it nevertheless escaped the attention of Bruguière, and for a long time that of both Cuvier and Lamarck. The genus Valvata was, nevertheless, adopted by these authors upon the revival of it by Draparnaud: upon noting the great resemblance that exists between the shell of Valvata and that of *Cyclostoma*, he at first referred it to that genus, but was subsequently led by the marked difference in their habits to appreciate the distinction allotted to it by Müller.

The shell of Valvata may be described as being spiral, with the spire either discoid, or rather elevated; the whorls are round, and convex, the last forming a large umbilicus; the aperture is circular, with the margin continuous, and the lip is simple and acute. The operculum is horny and spiral.

The Valvatæ, which are small, and not very abundant, are generally found upon aquatic plants, &c. in ponds and ditches.

Examples.

Pl. CXCVI. Fig. 1.

Valvata piscinalis, De Férussac, Syst. Conch., p. 75. De Blainville, Manuel de Malacologie, pl. 34. f. 4.

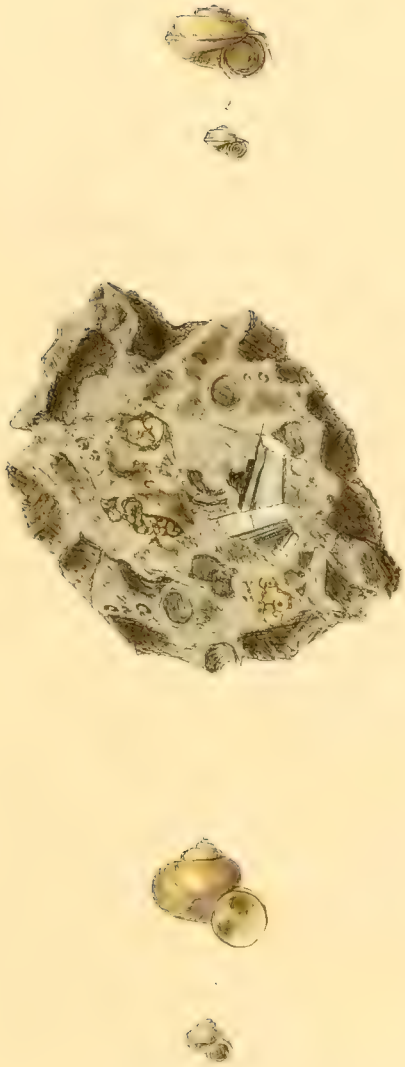
Le porte-plumet, Geoffroy.

Helix piscinalis, Gmelin.

Turbo cristatus, Poiret.

Cyclostoma obtusum, Draparnaud.

Plate CXCVI.



1 Valvata piscinalis.
2. . . . . carinata.

Valvata obtusa, Turton.
Turbo thermalis (*var.*), Dillwyn.
Helix fascicularis, Alten.

Pl. CXCVI. Fig. 2.

VALVATA CARINATA, Sowerby, Genera of Shells, No. 41.
Valvata tricarinata (*var.*), Deshayes.

PALUDINA, Lamarck.

Testa ovata, vel conoidea, epidermide olivaceâ induta; spirâ subturritâ, sæpè erosâ, anfractibus rotundis, planiusculis, aut carinatis; aperturâ rotundâ, vel ovatâ, margine continuo, labro simplici, acuto. Operculum corneum, orbiculare, aut spirale, aut concentricum.

We are again indebted to Geoffroy, who, like Draparnaud and Turton, devoted his attention more particularly to the land and freshwater mollusks, for an especial notice of the Paludinæ. He distinguished the common typical example of this series by the name of the *Vivipare-a-bandes*, significant of its natural method of propagation; Linnæus referred it to the *Helices*, and Draparnaud to the *Cyclostomata*; but when Cuvier, in his memoir on the anatomy of the Paludinæ, demonstrated the necessity of separating them on account of their being aquatic, they were set apart by Lamarck under the new title of *Vivipara*, a name which he afterwards changed for the one now commonly adopted.

We have followed Lamarck in associating the Paludinæ in the same family with the *Ampullariæ*, but they are not so closely allied to those mollusks as some authors have imagined; Sowerby, nevertheless, at one time proposed to distinguish these two genera only by the difference of their opercula, by which arrangement all the horny operculated *Ampullariæ* would be referred to the present genus. The proposition was, however, made before the true nature and habits of the *Ampullariæ* were known, and at a time when this author was somewhat enthusiastic in his

estimation of opercula: the operculum of a mollusk, however, forms no essential part of its organization, and we feel convinced that it cannot be relied upon as a generic character. The genus *Paludestrina* of D'Orbigny is intended for the reception of those varieties which have their eyes situated at the base of the tentacles instead of at the summit; their operculum also differs in being spiral instead of being concentric (vide Pl. CXCVII. Fig. 5.).

The shell of Paludina is described as being ovate or conoidal, and covered with an olivaceous epidermis; the spire is somewhat turrited, often eroded; the whorls are round, either smooth or carinated, and the aperture is also round or ovate, the margin being continuous, and the lip simple and acute. The operculum is horny and orbicular, either spiral or waved.

The Paludinæ are found in great abundance in the great rivers of India and America, particularly near the sea, and in places where the water is a little brackish.

Examples.

Pl. CXCVII. Fig. 1 and 1*.

Paludina achatina, Lamarck, Anim. sans vert., new edit., vol. viii. p. 512. Encyclopédie Méthodique, pl. 458. f. 1. *a*, *b*.
Helix fasciata, Gmelin.
Nerita fasciata, Müller.
Cyclostoma achatinum, Draparnaud.

Pl. CXCVII. Fig. 2.

Paludina ponderosa, Say, American Conchology, pl. 30. f. 1. Deshayes, new edition of Lamarck, vol. viii. p. 516.

Pl. CXCVII. Fig. 3.

Paludina olivacea, Sowerby, Genera of Shells, No. 41.

Pl. CXCVII. Fig. 4.

Paludina unicarinata, Sowerby, Genera of Shells, No. 41.

Plate CXCVII.

Fig. 1. *Paludina achatina*
1a. ..... its operculum
2. ..... *ponderosa*
3. ..... *olivacea*
4. ..... *unicarinata*

Pl. CXCVII. Fig. 5.

PALUDINA ———? Sowerby, Genera of Shells, No. 41.
Paludestrina ———? D'Orbigny.

AMPULLARIA, Lamarck.

Testa globosa, vel globoso-discoidea, epidermide olivaceâ induta; spirâ parvâ, acutiusculâ, anfractibus ventricosis, ultimo peramplo, umbilicum sæpissimè formante; aperturâ integrâ, plerumque oblongâ, supernè angulatim acutâ, margine continuo, labro subincrassato, interdum paululùm expanso, nunquam reflexo. Operculum annulatum, vel corneum, vel calcareum.

This genus, which also received its title from Lamarck, was like others anticipated by the early naturalists in the sectional subdivision of the genera that were in their time recognized. That author is, however, at least entitled to the credit of having been the first to arrange the Ampullariæ according to their true nature and habits; for whilst Linnæus placed them with the *Helices*, Bruguière with the *Bulimi*, and Müller with the *Neritæ*, he very judiciously associated them with only such other mollusks as are inhabitants of fresh water. Lamarck was nevertheless still unacquainted with the anatomy of the Ampullariæ; nor were the descriptions either of De Blainville, or De Férussac, of very elaborate character; now, however, the genus in question has become one of considerable interest; for the labours of Guilding, Quoy and D'Orbigny have discovered a feature in the organization of these mollusks which had not hitherto been noticed, namely, the fact of their having a double system of respiration,—both a *water-breathing* and an *air-breathing* system. This peculiarity of character, first intimated by Guilding in his 'Zoology of the Caribæan Islands,' was singularly confirmed by some specimens of Ampullariæ brought by M. Cailliaud from Africa. The discovery we

allude to was made accidentally, and is related with much enthusiasm by Deshayes. When M. Cailliaud opened a box of Ampullariæ on his return to Paris, he unexpectedly found, on placing them in water, that many were alive, although they had been confined for several months past. Deshayes, who was naturally surprised to find that these water-breathing pectinibranchiate mollusks had existed so long out of water, examined them more minutely; and upon the discovery of an unusual internal cavity, he was led to believe that they possessed the remarkable property of securing, by the assistance of a closely fitting operculum, a certain quantity of water for the purpose of sustaining respiration out of their natural element. The cavity, which Deshayes observed in the Ampullariæ, has, however, been discovered by D'Orbigny to be a distinct pulmonary apparatus, with which these animals are furnished in addition to the usual branchial cavity, in order to enable them to live for a time out of water. They differ essentially in this particular from the *Paludinæ*, for it is a change in which their system of respiration becomes subservient to the difference of their habits; the *Paludinæ* live in deep lakes or running waters, but the Ampullariæ are found located in shallow marshes, where the water is stagnant, and occasionally dried up.

The Ampullariæ are generally provided with a long siphon for the purpose of conveying the surrounding fluid to the respiratory cavities; the few that are destitute of this appendage have been separated by D'Orbigny under the title of *Ampulloidea* *. The reversed species of this genus form the *Lanistes* of De Montford; those which have the margin of the aperture thickened are distinguished by Guilding with the new appellation of *Pachystoma*, and the same author proposes the name of *Ceratodes* for the well-known *A. cornu arietis* and its cognate species,—species, which, according to the operculoidal classification of Sowerby, would belong to the genus *Paludina*. The genus *Ampullacera*, instituted by Quoy for the reception of the *Ampullaria avellana* of Lamarck, may also be abandoned,

* *Asolene* and *Ampulloidea*, both included by Gray in his family of *Ampullariadæ* as separate genera, are one and the same. *Asolene* is a name which D'Orbigny thought of giving to this genus, before he decided upon that of *Ampulloidea*.

Plate CXCVIII.

1 & 2 *Ampullaria rugosa*
3 *Cornu arietis*
4 *subcarinata*

as it merely exhibits a modification of the bispirate character common to the rest of the *Ampullariæ*.

The shell of Ampullaria may be described as being globose, or globosely discoidal, and covered with an olivaceous epidermis; the spire is small, and rather sharp, and the whorls are ventricose, the last being unusually large, and forming an umbilicus; the aperture is entire, generally oblong, and angularly acute at the upper part; the margin is continuous, and the lip, which is somewhat thickened, is sometimes a little expanded, but never reflected.

The Ampullariæ are most abundant in warm climates.

Examples.

Pl. CXCVIII. Fig. 1 and 2.

Ampullaria rugosa (?), Lamarck, Anim. sans vert., new edit., vol. viii. p. 532. Chemnitz, Conch., vol. ix. pl. 128. f. 1136. Encyclopédie Méthodique, pl. 457. f. 2. *a*, *b*.
Nerita urceus, Müller.
Bulimus urceus, Bruguière.
Ampullaria urceus, De Férussac.

Pl. CXCVIII. Fig. 3.

Ampullaria cornu arietis, Sowerby, Genera of Shells, No. 4. Encyclopédie Méthodique, pl. 460. f. 3. *a*, *b*.
Helix cornu arietis, Linnæus.
Planorbis contrarius, Müller.
Planorbis cornu arietis, Lamarck.
Ceratodes fasciata, Guilding.
Ceratodes cornu arietis, D'Orbigny.

Pl. CXCVIII. Fig. 4.

Ampullaria subcarinata, Sowerby, Genera of Shells, No. 4.
Lanistes ——— ? De Montford.

Family 3. NERITACEA.

Testa subglobosa, columellâ peramplâ, septiformi, obliquè effusâ. Animal vel fluviatile, vel marinum, operculo aut corneo, aut calcareo.

The family of the Neritacea includes a very natural and well-defined assemblage of mollusks, exhibiting in their habits a transition from the fluviatile to the marine kinds of the class; one portion of them are inhabitants of fresh water, the other marine. They were all associated by Linnæus in one and the same genus, *Nerita*, for he detected a peculiarity of structure in the septiform columella of their shells, which was sufficient in his opinion to constitute their chief generic character. The Neritacea, however, have not only been divided into five genera, after the manner here followed, but they have been assigned by Cuvier, De Férussac, and others to different parts of the class. The Navicellæ, for example, were arranged by those authors in the immediate vicinity of the *Crepidulæ*, a genus of *Capulacea*, though it is really difficult to imagine how they could have been tempted to associate together two genera of mollusks differing so materially in their habits; the one remaining adherent, and marine, whilst the other is fluviatile and free; the one having a shell exceedingly variable both in form and structure, shaping itself to the irregularities of its place of attachment; whilst the shell of the other always exhibits a regular uniformity of growth, never varying in its formation, and pre-eminently distinguished in being operculated. The Naticæ, again, have been considered by some writers to be hardly separable from the *Sigareti*; for, like those mollusks, they have a very widely-expanded disc, by which their shell is almost entirely enveloped.

The Neritacea are very numerous in species, and we are much indebted to M. Recluz for the elaborate manner in which the new ones have been lately described.

The shell of the Neritacea, as we have already stated, is chiefly distinguished by the septiform structure of the columella, which forms, as it

were, the straight side of a semicircular aperture; De Blainville has altered the name of Neritacea to that of *Hemicyclostomata* in order to distinguish this peculiarity of form in the aperture; but we shall ever remain opposed to these unnecessary changes in the nomenclature.

The following are the five genera into which this family is divided:

Fluviatilia:	*Marina:*
Navicella.	Nerita.
Neritina.	Neritopsis.
	Natica.

NAVICELLA, Lamarck.

Testa transversim elliptica, vel oblonga, patellæformis, supernè convexa, epidermide olivaceâ induta; spirâ nullâ; vertice ad marginem subobliquè inflexo; labro integro, complanato, supernè columellam tenuissimam formante; aperturâ amplissimâ, impressionibus muscularibus duabus distinctè imbutâ. Operculum testaceum, subquadratum, solidum, planum, dente laterali, acuto, instructum.

The genus Navicella was introduced by Lamarck in order to distinguish a small group of fluviatile mollusks that had been associated by Gmelin, De Roissy, and others with the *Crepidulæ*. They were assigned to that genus by those authors on account of the crepiduliform convexity of their shells, without, perhaps, being aware of the important difference in their habits: this was, however, detected by Lamarck, and the same observations were simultaneously made both by De Montford and De Férussac; for whilst they were separated from the *Crepidulæ* by the former for the formation of his genus *Cimber*, the latter proposed to distinguish them with the new generic appellation of *Septaria*. De Férussac still continued to follow, to a certain extent, the arrangement of his predecessors in placing the Navicellæ in the same family with the *Crepidulæ*; so also

did Cuvier; but when the anatomy of these animals was finally examined by De Blainville, their affinity with the Neritinæ became manifest, confirming as accurately as possible the propriety of Lamarck's arrangement. The Navicellæ differ from the *Crepidulæ* in being fluviatile; they differ also in being furnished with an operculum; they do not become attached to other bodies; nor do they exhibit any irregularity of growth. The same regularity, which always marks the growth of the shell, is imparted to the septiform columella, and in all these several particulars they entirely agree with the *Neritinæ*.

Until within the last few months only five species of Navicellæ were known; ten new ones have been recently described by M. Recluz, and we have two or three more still to come from the inexhaustible stores of Mr. Cuming.

The shell of Navicella may be described as being transversely elliptic, or oblong, patellæform, convex superiorly, and covered with an olivaceous epidermis; it has no spire; the vertex is obliquely inflected at the margin, and the lip is entire and flattish, forming superiorly a very thin, septiform columella; the aperture is very large, and distinctly marked with two muscular impressions, one on each side. The operculum is testaceous, and nearly square; it is solid, flat, and has a sharp lateral projection.

Examples.

Pl. CXCIX. Fig. 1.

NAVICELLA TESSELLATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 564. Encyclopédie Méthodique, pl. 456. f. 3. *a*, *b*. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 380.

Pl. CXCIX. Fig. 2 and 3.

NAVICELLA LINEATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 564. Encyclopédie Méthodique, pl. 456. f. 2. *a*, *b*. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 380.

Septaria navicula, De Férussac.

NAVICELLA.

Plate CXCIX.

G.B.S. Junr.

Pl. CXCIX. Fig. 4.

NAVICELLA ATRA, *Nobis*, Proceedings Zool. Soc., 1842.
Navicella clypeolum, var. δ. Recluz, MSS.

Pl. CXCIX. Fig. 5, 8 and 11.

NAVICELLA PORCELLANA, Deshayes, Note in new edition of Lamarck, vol. viii. p. 563. De Blainville, Manuel de Malacologie, pl. 36. f. 1. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 372.
Patella porcellana, Linnæus.
Nerita porcellana, Chemnitz.
Patella Borbonica, Bory-St.-Vincent.
Crepidula Borbonica, De Roissy.
Septaria Borbonica, De Férussac.
Navicella elliptica, Lamarck.
Septaria elliptica, Guérin.
Scandalinum pictum, Schumacher.

Pl. CXCIX. Fig. 6.

NAVICELLA RECLUZII, *Nobis*, Proceedings Zool. Soc., 1842.
Navicella clypeolum, var. ζ. Recluz, MSS.

Pl. CXCIX. Fig. 7.

NAVICELLA RADIATA. *Nobis*, Proceedings Zool. Soc., 1842.
Navicella clypeolum, var. γ. Recluz, MSS.

Pl. CXCIX. Fig. 9.

NAVICELLA LUZONICA, Souleyet. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 375.

Pl. CXCIX. Fig. 10.

NAVICELLA DEPRESSA, Lesson, Voy. de la Coquille, Zoologie, p. 368. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 373.
Navicella elliptica, var. Sowerby.

Pl. CXCIX. Fig. 12.

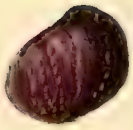
NAVICELLA SUBORBICULARIS, Sowerby, Appendix to Tankerville Catalogue, p. 10. Recluz, Revue Zoologique Soc. Cuv., 1841, p. 378.

NERITINA, Lamarck.

Testa tenuis, subglobosa, epidermide olivaceâ induta; spirâ indistinctâ, interdum ferè obsoletâ, anfractibus interdum spinis cavis ornatis; aperturâ semirotundâ; columellâ planulatâ, effusâ; labro simplici, interdum utrinque latissimè dilatato. Operculum testaceum, semiovatum, appendice laterali, acuto, instructum.

Lamarck's method of separating the freshwater mollusks from those that are marine, a plan which he judiciously adopted in all cases where it may be carried out with tolerable accuracy, and without injury to the system, suggested to him the formation of the present genus. Before his time the Neritinæ were not elevated to the rank which is now commonly assigned to them, but merely distinguished as "the freshwater Nerites," in a section of the genus *Nerita*; the difference between the habits of the *Neritæ* and *Neritinæ* is, however, so faithfully indicated by the composition and general appearance of their shells, that, with all deference to the views of so excellent a conchologist as Deshayes, we think the distinction ought not to be abandoned. The Neritinæ have much thinner shells than the *Neritæ*, and they differ in being always covered with an epidermis; another distinguishing character is, that the margin of the aperture is never crenulated. The Neritinæ notwithstanding seem to possess a vast modification of habit, for, like some other aquatic mollusks, they appear to have the faculty of living for a considerable time out of water: an instance is recorded by Lesson of his finding the Neritinæ upon the branches of trees planted at some little distance from the river side; and Cuming informs us that he has collected them in abun-

Plate CC.



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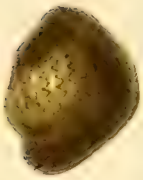

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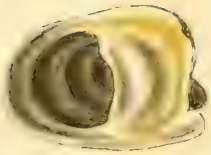

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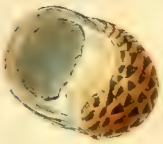

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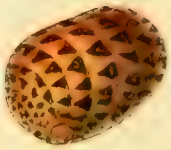

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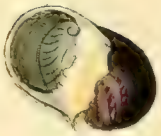

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dance off the leaves of palms, at least twenty feet from the ground, and full two or three hundred yards from any water.

The *Neritina corona* and its cognate species constitute the genus *Clithon* of De Montford; the *Neritina virginea*, and those allied to it, form his genus *Theodoxus*; and the *Neritina perversa*, a fossil species, has been distinguished by the same author with the generic title of *Velates*.

The shell of Neritina may be described as being thin, somewhat globose, and covered with an olive-green epidermis; the spire is indistinct, or nearly obsolete, with the whorls sometimes ornamented with hollow spines; the aperture is semicircular, and the columella is flat and spread out; the lip is simple, and sometimes widely dilated on both sides. The operculum is testaceous, semiovate, and furnished with a sharp lateral appendage.

Examples.

Pl. CC. Fig. 14.

NERITINA SUBGRANOSA, Sowerby, Conch. Illus. Cat., No. 41. p. 3.

Pl. CC. Fig. 15.

NERITINA OWENIANA, Gray. Wood, Index Test. Supp. pl. 8. f. 8. Sowerby, Conch. Illus. Cat., No. 25. p. 2.

Pl. CC. Fig. 16.

NERITINA LATISSIMA (var.), Broderip, Proceedings Zool. Soc., 1832, Part II. p. 201. Sowerby, Conch. Illus. Cat., No. 29. p. 3.

Pl. CC. Fig. 17.

NERITINA LAMARCKII, Deshayes, new edition of Lamarck, vol. viii. p. 578.

Neritina auriculata (?), Lamarck.

Pl. CC. Fig. 18.

NERITINA PIPERINA, Chemnitz, Conch., vol. xi. p. 173. pl. 197. f. 1905 and 1906. Lamarck, Anim. sans vert., new edit., vol. viii. p. 584.

Pl. CCI. Fig. 19.

NERITINA MELEAGRIS, Lamarck, Anim. sans vert., new edit., vol. viii. p. 575. Sowerby, Conch. Illus. Cat., No. 19. p. 2. Wood, Index Test. Supp., pl. 8. f. 18.

Nerita pulchella, Wood.

Pl. CCI. Fig. 20.

NERITINA CORONA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 571. Chemnitz, Conch., vol. ix. pl. 124. f. 1083 and 1084.

Nerita corona, Linnæus.

Clithon corona, De Montford.

Pl. CCI. Fig. 21.

NERITINA PUNCTULATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 584. Encyclopédie Méthodique, pl. 455. f. 2.

Pl. CCI. Fig. 22.

NERITINA CANALIS, Sowerby, App. to Tankerville Catalogue, p. 11. Wood, Index Test. Supp., pl. 8. f. 17.

Pl. CCI. Fig. 23.

NERITINA SEMI-CONICA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 574. Chemnitz, Conch., vol. ix. pl. 124. f. 1087.

NERITA, Linnæus.

Testa solida, semiglobosa, subtùs planiuscula, extùs vel lævigata, vel costata, spirâ brevi; umbilico nullo; aperturâ semirotundâ, intrò plerumque crenatâ; columellâ amplâ, septiformi, sæpiùs denticulatâ, margine rotundato, labro vel simplici, vel crenulato. Operculum testaceum, appendiculatum.

Linnæus is accounted to be the author of the present genus; but the

NERITINA.

Plate CCI.

G.B.S. Jun. exc.

Plate CCII.

1 & 2. Nerita peloronta.
3. ..... chlorostoma, Lam.
4. ..... ornata, nob.
5. ..... ? granulata.
6. ..... tricarinata.

Neritæ were distinguished long before by Lister in the plates of his 'Synopsis Conchyliorum;' and they were distributed by this excellent draughtsman in the order subsequently adopted by Lamarck; the *Neritinæ*, the Neritæ and the *Naticæ* being respectively associated by themselves. We have sufficiently explained in our observations on the preceding genus, why the first two of these divisions should remain separated; the *Naticæ* are still more distinct; in treating of them we shall be enabled to show that they differ materially, approaching rather in their organization to the *Sigareti*.

The shell of Nerita may be described as being solid, semiglobose, flattish underneath, and either smooth or ribbed on the outside. The spire is short, there is no umbilicus, and the aperture is semicircular, and generally crenated within; the columella is wide, septiform, and for the most part denticulated; the lip is either simple or crenulated. The operculum is testaceous, and furnished, like that of the *Neritinæ*, with a sharp lateral appendage.

The Neritæ are all marine, and their shells exhibit a great diversity of colour.

Examples.

Pl. CCII. Fig. 1 and 2.

NERITA PELORONTA, Linnæus, Syst. Nat., p. 778. Chemnitz, Conch., vol. v. pl. 192. f. 1977 to 1984. Encyclopédie Méthodique, pl. 454. f. 2. *a*, *b*.

Peloronta —— ? Oken.

Pl. CCII. Fig. 3.

NERITA CHLOROSTOMA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 603. Encyclopédie Méthodique, pl. 454. f. 4. *a*, *b*.

Pl. CCII. Fig. 4.

NERITA ORNATA, Sowerby, Genera of Shells, No. 10.

Pl. CCII. Fig. 5. (fossil.)

NERITA GRANULATA, Defrance. Sowerby, Genera of Shells, No. 10.

Neritopsis (?)

Pl. CCII. Fig. 6. (fossil.)

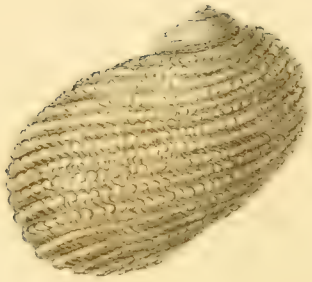
NERITA TRICARINATA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 616. Ann. du Mus., vol. v. p. 94; and vol. viii. pl. 62. f. 4. *a*, *b*. Deshayes, Coq. Foss. de Paris, vol. ii. p. 160. pl. 19. f. 9 and 10.

NERITOPSIS, Sowerby.

Testa obovata, extùs granosa, anfractibus paucis, rapidè crescentibus, spirâ brevi, apice subelato, acuto; aperturâ transversâ, subsemilunari, marginibus disjunctis; labro incrassato, fauce tenuiter sulcatâ; columellâ solidâ, propè ad medium latè emarginatâ. Operculum tenue, corneum, non spirale.

The genus Neritopsis was introduced by Sowerby for the sake of distinguishing a delicate cancellated shell, that was known to Linnæus, Born, Chemnitz and others of their day as the *Nerita radula**. The Neritopses,

* We cannot but appreciate this excellent genus, as founded by Sowerby upon the shell which is given in his 'Genera' in illustration of it; but he is mistaken in supposing it to be the *Sigaretus cancellatus* of Lamarck, *Nerita cancellata* of Chemnitz: both shells are now before us, and we therefore hasten without diffidence to correct the inaccuracy. It is not surprising that they should have been figured and described by Chemnitz under the same generic title, for his *Neritæ radula* and *cancellata*, the shells in question, are not unlike in colour and general form; but a very slight examination would have shown him that whilst the former, *Neritopsis*, is rather a solid shell, granulated on the outside upon ribs running longitudinally, independent of the peculiar formation of the columella, the latter is thin, light, ventricose, and cancellated in ribs running in a transverse direction. But of their animal inhabitants?—we know nothing certainly of the first of these, yet, upon looking at its shell, can fairly trace an affinity between the *Neritopsis* and the *Neritæ* by analogy; the second, however, which was removed by Lamarck to a place amongst the *Sigareti*, from a conviction that it presents few characters in common with the *Neritæ*, is, in reality, allied to the *Velutinæ*. We are indebted to M. Quoy for both a figure and description of this mollusk in his 'Zoologie' of the 'Voyage de l'Astrolabe,' under the title of *Velutina cancellata*; although it is referred to that genus, he nevertheless suggests that it might be set apart for the formation of a new one,



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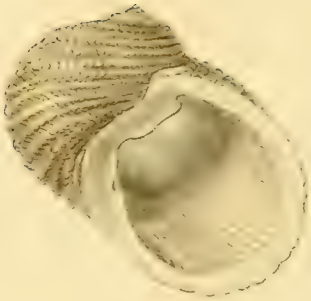

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1. Nerilopsis Cancellata.
2. -- ---- Granulata.
3 ---- -- Granosa.

however, are found to differ essentially from the *Neritæ*, especially in the formation of the shell at the columella, there being a singular kind of gap in the middle of it, which looks exactly as if a square piece had been chipped out with a chisel, or as if the pillar of the shell had been partially eaten away by a crab.

The shell of Neritopsis may be described as being of an obovate form, consisting of three or four whorls, increasing rapidly in size, with a short spire, which is sharp and somewhat raised at the apex; the aperture is transverse, nearly semilunar, and the margins are disjoined, the lip being thickened, and deeply striated to within a given distance on the inside; the columella is solid, and widely notched out near the middle. The operculum is thin, horny, and simple.

Examples.

Pl. CCIII. Fig. 1.

NERITOPSIS CANCELLATA, Sowerby, Genera of Shells, No. 42.

Nerita radula, Linnæus. Chemnitz, Conch., vol. v. pl. 190. f. 1946 and 1947.

Platystoma granulatum, Klein.

Pl. CCIII. Fig. 2. (fossil.)

NERITOPSIS GRANULATA, Sowerby, Genera of Shells, No. 42.

Pl. CCIII. Fig. 3. (fossil.)

NERITOPSIS GRANOSA, Sowerby, Genera of Shells, No. 42.

and he proposes the title of *Vanikoro*, after its locality; but this word must be abandoned,—it is both ungrammatical, and opposed to all rules of nomenclature. Gray, with his accustomed alacrity, has not only accepted the genus *Vanikoro*, but created a special family for its reception, *Vanicoroïdæ*; we cannot, however, agree with him in placing it next in order to the *Capulacea*, for it is evident that there is the same important difference between *Vanikoro* (*Velutina cancellata*) and *Pileopsis*, as we have already noted to exist between *Navicella* and *Crepidula*; in one the shell exhibits a perfect regularity of growth, is free and operculated; in the other it always remains adherent, and becomes shapen to the irregularities of its place of attachment.

NATICA, Adanson.

Testa subglobosa, rarò ovata, spirâ brevi, anfractibus plus minusve conspicuis, ultimo umbilicum profundum, interdum impletum, formante; columellâ obliquâ, edentulâ, callo spirali interdum instructâ, introrsus umbilicum attenuante; aperturâ integrâ, semiorbiculari, margine tenui, acuto. Operculum vel testaceum, vel corneum.

The genus Natica was proposed by Adanson; and when we consider how materially the animals which are referred to it differ from those of the preceding genus, we are somewhat surprised that Linnæus did not more fully appreciate the labours of this intelligent traveller. The Naticæ were always included by the author of the 'Systema Naturæ' in his genus *Nerita*; and although the twelfth edition of that work did not appear until some time after the publication of Adanson's 'Voyage en Sénégal,' they yet remained unaltered. The genus Natica was, however, followed by Bruguière, and it has been adopted by all succeeding naturalists, with the exception of Cuvier, who merely distinguished these mollusks by the title of "les Nérites ombiliqués." The true organization of the Naticæ appears to have been but little known to these authors: we learn from M. Quoy that their shell is almost entirely concealed within the pedal disc as in the case of the *Sigareti*; D'Orbigny gives a similar account of them; and we have repeatedly confirmed this fact by our own observations.

The *Natica mamilla*, and such as have a mamillary spire, with the umbilicus filled up with enamel, constitute the genus *Polinices* of De Montford.

The shell of Natica may be described as being somewhat globose, rarely ovate, and having a short spire, with the whorls more or less conspicuous, the last forming a deep umbilicus, which, however, is sometimes filled up; the columella is oblique, edentulate, and sometimes furnished with a spiral callosity attenuating inwards, towards the umbilicus; the aperture is entire, and semiorbicular, with the margin thin and acute. The operculum is either testaceous, or horny.

1. *Natica Canrena.*
2 *Mammilla.*
3 *cepacea.*
4 *Canrena, Brocchi.*

Examples.

Pl. CCIV. Fig. 1.

NATICA CANRENA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 633. Chemnitz, Conch., vol. v. pl. 186. f. 1860 and 1861.
Nerita canrena, Linnæus.

Pl. CCIV. Fig. 2.

NATICA MAMILLA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 630. Chemnitz, Conch., vol. v. pl. 189. f. 1928 to 1931.
Nerita mamilla, Linnæus.
Polinices ——— ? De Montford.

Pl. CCIV. Fig. 3. (fossil.)

NATICA CEPACEA, Lamarck, Anim. sans vert., new edit., vol. viii. p. 653. Ann. du Mus., vol. v. p. 96 ; and vol. viii. pl. 62. f. 5. *a*, *b*. Deshayes, Désc. Coq. Foss. de Paris, vol. ii. p. 168. pl. 22. f. 5 and 6.

Pl. CCIV. Fig. 4. (a fossil shell from Piacenza.)

Family 4. IANTHINEA.

Animal vesiculis cartilagineis plurimis, disco affixis, super aquas jugiter latum.

The Ianthinea, though few in number, differ materially from other mollusks both in their organization and habits ; their shell is exceedingly light and fragile, but they are nevertheless marine. The peculiarity of these animals consists in having the ventral part of the pedal disc furnished with a number of cartilaginous vesicles, which cause them to float upon the surface of the ocean, and they have also a small wing-like appendage attached to each side of the body. It has been supposed by some authors that the Ianthinea have the power of contracting or inflating these air-

bubbles, in order that they may sink or swim at pleasure; we dare not, however, venture upon this assertion, as it has not yet been satisfactorily ascertained: others have imagined that this vesicular organ is a modification of the operculum of mollusks, but we see no trace of analogy between two organs which are destined to perform such peculiar and distinct offices.

The Ianthinea, of which only two or three species are as yet known, are included in the following genus:

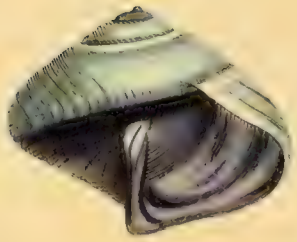
IANTHINA.

IANTHINA, Lamarck.

Testa violacea, subglobosa, turbiniformis, fragilis; spirâ subdepressâ, anfractibus aut rotundatis, aut acuto-triangularibus; aperturâ integrâ, basi angulatâ, marginibus disjunctis; labro tenuissimo, acuto, in medio, quasi sinu, angulato; columellâ elongatâ, rectâ, reflexâ.

The peculiarity of structure just described as distinguishing the Ianthinæ from other mollusks, was first figured by Forskael, a Swedish naturalist contemporary with Linnæus; and it therefore becomes a matter of surprise that the shell of Ianthina, which had been known to writers since the time of Fabius Columna, should have been arranged by the great author of the 'Systema Naturæ' in the same natural division with the *Helices*. The immense difference in the habits and organization of these animals is most striking, and we fear that this is but one of many instances in which that immortal generalizer might have profited considerably by the labours of others, in the last edition of his esteemed and comprehensive work. Lamarck soon discovered the necessity of setting the Ianthinæ specially apart by themselves: to him we are indebted for the formation of the present genus, and to Cuvier for the demonstration of their anatomy.

In consequence of the abundant violet juices of the Ianthinæ, their shell



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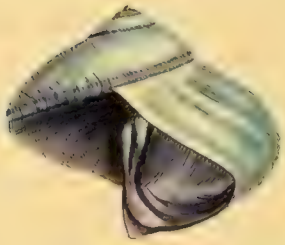

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1. *Ianthina fragilis.*
2. ..... *exigua.*
3. . . *aucta*

is always of a deep violet colour both within and without. It may be described as being somewhat globose, turbiniform, and fragile, the spire being depressed, with the whorls either rounded, or acutely triangular; the margins are disjoined, and the lip is very sharp, thin, and angulated in the middle as if with a sinus; the columella is long, straight, and reflected.

Examples.

Pl. CCV. Fig. 1.

IANTHINA FRAGILIS, Bory-St. Vincent. Encyclopédie Méthodique, pl. 456. f. 1. *a, b.* DeBlainville, Manuel de Malacologie, pl. 37. f. 1.
Helix ianthina, Linnæus.
Ianthina communis, Lamarck.

Pl. CCV. Fig. 2 and 3.

IANTHINA EXIGUA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 206. Encyclopédie Méthodique, pl. 456. f. 2. *a, b.*

Family 5. PLICACEA.

Testa columellâ obliquè plicatâ, aperturâ integrâ, ad basem rotundatâ. Animal marinum, operculo corneo instructum.

This family was instituted by Latreille for the reception of a small group of water-breathing mollusks whose shells somewhat resemble those of the *Auriculacea*, a tribe which breathe only in air. They agree with them in having the columella plaited, with the base of the aperture entire, but differ essentially in being marine and operculated, and we are somewhat surprised that De Blainville should still refuse to separate them. Lamarck hastened to adopt the arrangement of Latreille even before the Plicacea were known to be operculated, and he has been followed in it by most succeeding naturalists.

The Plicacea have a small, thin, horny operculum, and their shell is

characterized by its having the columella strongly plaited, with the base of the aperture entire.

The family of the Plicacea consists of the two following genera, neither of which is very numerous in species:

TORNATELLA. PYRAMIDELLA.

TORNATELLA, Lamarck.

Testa ovalis, cylindracea, plerumque transversim striata, rarò lævissima, spirâ brevi, apice acuto; aperturâ longitudinali, supernè angustatâ, infernè integrâ, rotundatâ; columellâ incrassatâ, valdè plicatâ; labro simplici, solido, acuto.

The very wide range of characters which were selected by Linnæus for the determination of genera induced many inaccuracies in his method of classification which might certainly have been avoided, if, instead of generalizing upon the external variations of the shell, he had pursued a more searching inquiry, like Adanson and Forskael, into the nature of its animal inhabitant. His genus *Voluta*, for example, founded upon the character of the columella being obliquely plaited, included both phytophagous and zoophagous mollusks, animals both with and without proboscis or branchial siphon. The presence or absence of these organs, however, distinguishing the plant-eating from the flesh-eating mollusks, is still indicated to a certain extent in the shell by the basal formation of the aperture; and Bruguière, the conchologist of the 'Encyclopédie Méthodique,' appears to have sagaciously detected the difference between the shells of the true *Volutæ*, and those which were subsequently selected by Lamarck for the formation of this genus, the base of the aperture being sinuated or canaliculated in the one, and entire in the other. But the alteration proposed by Bruguière was little or no improvement upon the arrangement of Linnæus; for in removing them to his new genus *Bulimus*, they became associated with a miscellaneous assemblage of mol-

Plate CCVI.

G.B.S. Jun.

lusks differing most essentially both in their organization and habits. They were then distinguished by Lamarck with the generic title of Tornatella, whilst De Blainville included them with the *Pedipes*, a genus of air-breathing mollusks of the family *Auriculacea*. The arrangement followed by the learned author of the 'Manuel de Malacologie' was scarcely better than that of his predecessor Bruguière; he, however, cautiously abandoned it when the propriety of Lamarck's distribution of the Tornatellæ was subsequently confirmed by Gray in the discovery of their being operculated.

The shell of Tornatella may be described as being oval, cylindrical, generally striated transversely, and having a short spire, always sharp at the apex; the aperture is longitudinal, narrowed towards the upper part, and entire and rounded at the lower; the columella is thickened and strongly plaited, and the lip is simple, solid and acute.

Examples.

Pl. CCVI. Fig. 1, 4 and 6.

TORNATELLA FLAMMEA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 219. Lister, Synop. Conch., pl. 814. f. 24. Sowerby, Genera of Shells, No. 24. f. 1. Kiener, Iconographie des Coquilles, pl. 1. f. 1.
Auricula flammis lateritiis, Martini.
Voluta flammea, Gmelin.
Bulimus variegatus, Bruguière.

Pl. CCVI. Fig. 2.

TORNATELLA INSCULPTA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVI. Fig. 3.

TORNATELLA TESSELLATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVI. Fig. 5.

TORNATELLA NITIDULA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 221. Encyclopédie Méthodique, pl. 452. f. 2. *a*, *b*. Sowerby, Genera of Shells, No. 24. f. 2. Kiener, Iconographie des Coquilles, pl. 1. f. 5.

Pl. CCVI. Fig. 7.

TORNATELLA SOLIDULA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 220. Chemn., Conch., vol. x. pl. 149. f. 1405. Kiener, Iconographie des Coquilles, pl. 1. f. 2.

Voluta solidula, Linnæus.

Bulimus solidulus, Bruguière.

Pl. CCVI. Fig. 8 and 9.

TORNATELLA VIRGATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVI. Fig. 10.

TORNATELLA COCCINATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVI. Fig. 11.

TORNATELLA FASCIATA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 220. Martini, Conch., vol. ii. pl. 43. f. 442 and 443. Encyclopédie Méthodique, pl. 452. f. 3. *a*, *b*. Kiener, Iconographie des Coquilles, pl. 1. f. 3.

Voluta tornatilis, Linnæus.

Auricula bifasciata, Martini.

Bulimus tornatilis, Bruguière.

Pl. CCVI. Fig. 12.

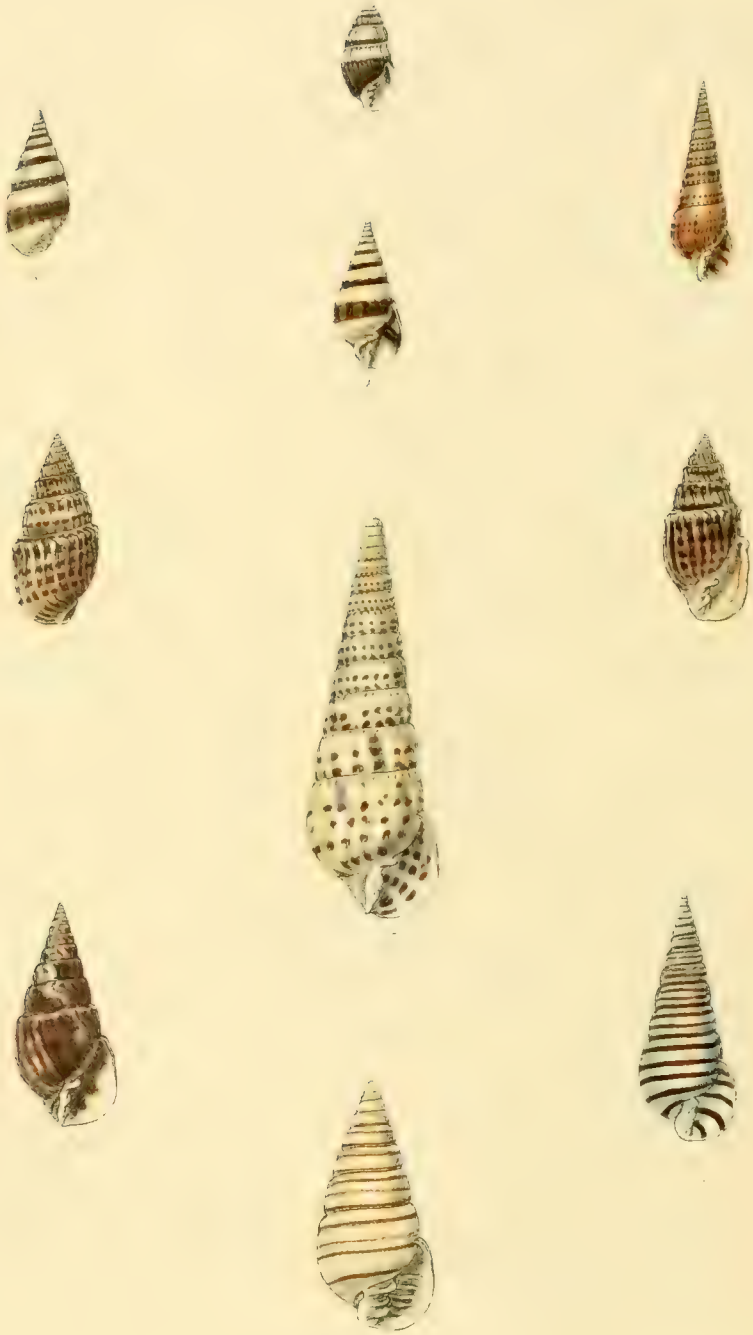
TORNATELLA GLABRA, *Nobis*, Proceedings Zool. Soc., 1842.

PYRAMIDELLA, Lamarck.

Testa turriculata, polita, anfractibus plurimis, apice acuto; aperturâ integrâ, supernè angustatâ, infernè rotundatâ; columellâ plerumque triplicatâ, labro acuto, paululum expanso. Operculum corneum.

The genus Pyramidella was introduced by Lamarck for the purpose of distinguishing a small series of shells, which, in the absence of their ani-

Plate CCVII.



mal inhabitants, were supposed to be intermediate in their organization between the *Melaniæ* and the *Auriculæ*. They had been variously distributed by authors; Linnæus included them with the *Trochi*, Müller with the *Helices*, and Bruguière with the *Bulimi*; the *Tornatellæ* are, however, the only mollusks to which they are intimately allied, both having the aperture of their shells entire and operculated, besides being strongly plaited on the columella.

The shell of Pyramidella may be described as being turriculated, polished, composed of many whorls, and sharp at the apex; the aperture is entire, and narrowed towards the upper part; the lower part of it is rounded; the columella has generally three plaits, and the lip is sharp and somewhat expanded. The operculum is small, thin and horny.

Examples.

Pl. CCVII. Fig. 1.

PYRAMIDELLA GLANS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVII. Fig. 2 and 4.

PYRAMIDELLA CINCTA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCVII. Fig. 3 and 7.

PYRAMIDELLA MACULOSA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 223. Encyclopédie Méthodique, pl. 452. f. 1. *a*, *b*. Kiener, Iconographie des Coquilles, pl. 2. f. 5. and 5 *a*.

Pl. CCVII. Fig. 5 and 6.

PYRAMIDELLA PLICATA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 223. Encylopédie Méthodique, pl. 452. f. 3. *a*, *b*.
Voluta spiralis, Rumphius. Wood.
Pyramidella punctata, Wagner.

Pl. CCVII. Fig. 8.

PYRAMIDELLA VENTRICOSA, Quoy and Gaimard, Voyage de l'Astrolabe, Zoologie, pl. 65. f. 37. Kiener, Iconographie des Coquilles, pl. 1. f. 1.

Pl. CCVII. Fig. 9 and 10.

PYRAMIDELLA DOLABRATA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 222. Chemnitz, Conch., vol. v. pl. 167. f. 1603 and 1604. Encyclopédie Méthodique, pl. 452. f. 2. *a*, *b*.
Trochus dolabratus, Linnæus.
Bulimus dolabratus, Bruguière.

Family 6. TURBINACEA.

Testa turbinata, seu conoidea, seu turriculata, anfractibus nunc confertim, nunc laxè volutis. Operculum vel corneum, vel testaceum.

The family of the Turbinacea corresponds as nearly as possible with the two genera *Trochus* and *Turbo* of Linnæus; but the species which have been added to this group since his time present a sufficient diversity of character for the formation of thirteen good generic divisions, completing the phytophagous or plant-eating series of the class. The form we have adopted for this family is precisely that in which it was first introduced by Lamarck, as we see no necessity now for the alteration which he subsequently made of associating the genera *Delphinula*, *Scalaria* and *Vermetus* in a separate family under the new title of "*Les Scalariens.*" He was induced to distinguish these genera thus on account of the loose manner in which the whorls of their shells are coiled in comparison with those of the rest of the family; this character, however, is so much more prominently developed in the shell of *Vermetus* than in that of *Scalaria* or *Delphinula*, that, since it has been found necessary to remove the *Vermeti* to another part of the system, the separation is no longer required. De Blainville has founded new families upon the two primitive divisions of Lamarck; the *Trochi* are taken as the type of the first under the title of the *Goniostomata*; and the *Turbines* as the type of the second, under that of the *Cricostomata*; but in

this last family he introduces certain genera, such as *Siliquaria*, *Cyclostoma*, *Paludina*, &c., of the most anomalous character, for reasons which we cannot understand.

The shell of the Turbinacea may be described as being either conoidal, or turriculated, with the whorls sometimes closely, sometimes loosely coiled together, and it is generally furnished with an operculum, which is either horny or shelly in species of the same genus.

The following are the thirteen genera which we refer to this family:

Rissoa.	Trochus.
Eulima.	Turbo.
Scalaria.	Margarita.
Delphinula.	Littorina.
Solarium.	Phasianella.
Phorus.	Turritella.
Rotella.	

RISSOA, Fréminville.

Testa parva, turriculata, apice acuminato; aperturâ ovali, suborbiculari, integrâ, supernè trigoniusculâ, infernè subeffusâ, margine incrassato, non reflexo, propè ad columellam, subcanaliculato. Operculum corneum.

The genus Rissoa was proposed by Fréminville for the reception of a few mollusks that had been confounded by Lamarck with the *Turbines* and the *Melaniæ*; they were also distinguished about the same time by Hartmann, in his account of the shells of Switzerland, by the generic title of *Acmea*. Linnæus appears also to have referred the only species with which he was acquainted to his genus *Turbo*, probably on account of a certain resemblance in its shell to that of *Scalaria*; it differs, however, in

not being of the same tubular construction, and in not having the margin of the aperture reflected.

D'Orbigny introduces a subgenus with the name of *Rissoina* for such as have the margin of the aperture sinuated or obsoletely canaliculated.

The shell of Rissoa may be described as being small, turriculated, and acuminated at the apex; the aperture is oval, nearly orbicular, and entire, somewhat triangular at the upper part, and slightly spread out at the lower; the margin is thickened, not reflected, and somewhat canaliculated near the columella. The operculum is horny.

Examples.

Pl. CCVIII. Fig. 1. (fossil.)

Rissoa reticulata, Philippi, Enum. Moll. Sicil., p. 156. pl. 10. f. 14.

Pl. CCVIII. Fig. 2.

Rissoa deformis, Sowerby, Genera of Shells, No. 40.
Rissoina ——— ? D'Orbigny.

Pl. CCVIII. Fig. 3.

Rissoa spirata, Sowerby, Genera of Shells, No. 40.

Pl. CCVIII. Fig. 4.

Rissoa acicula, Sowerby, Genera of Shells, No. 40.

EULIMA, Risso.

Testa parva, turriculata, acuminata, polita, anfractibus plurimis, versus apicem sæpè contortis; seu umbilico profundo, seu columellâ solidâ umbilico nullo; aperturâ ovatâ, supernè acutè angulatâ, infernè vel angulatâ, vel rotundatâ, labro subincrassato, varices obsoletos interdum formante. Operculum corneum, tenue, nucleo antico.

Plate CCVIII.

Fig. 1. Rissoa reticulata
... 2. .... deformis.
.. 3. ..... spirata.
.. 4. ..... acicula.

The Eulimæ, which were first distinguished by Risso, are closely allied to the *Rissoæ*; indeed it has been often a matter of hesitation with us whether we should continue to separate them or not; as in that division, the normal species of the group was referred by Linnæus to his genus *Turbo*, and the greater part of them have been also confounded by subsequent naturalists with the *Melaniæ*. The Eulimæ are so well characterized by their shells being highly polished, as well as by the spire being peculiarly contorted towards the apex, that they can scarcely fail to be recognized; and the first of these characters may be regarded as one of no little importance, because it indicates that these mollusks must have their mantle unusually expanded over the outer surface of the shell.

These distinctive characters, however, do not so forcibly apply to the shells of certain species lately admitted into this genus by Sowerby; they differ, moreover, both in being umbilicated and in having the aperture somewhat angulated at the base. Deshayes separates them under the new generic title of *Bonellia*, but he is yet unacquainted with their anatomy; it therefore remains to be determined whether the peculiarities which have been noted in the shells of these Eulimæ are the consequence of any change in the organization of their animal inhabitants; and upon this must the propriety of his genus depend.

The shell of Eulima may be described as being small, turriculated, acuminated, polished, and composed of numerous whorls, somewhat twisted towards the apex; in some cases they are rolled so as to exhibit a deep umbilicus; in others the columella is solid, and there is no umbilicus; the aperture is ovate, acutely angulated above, and either angulated or rounded below; the lip is somewhat thickened, and often leaves a number of obsolete varices upon the whorl as it enlarges in growth. The operculum is thin, horny, and has an anterior nucleus.

This is, we believe, the genus *Parthenia* of Lowe.

Examples.

Pl. CCIX. Fig. 1, 1*, and 1**.

EULIMA MAJOR, Sowerby, Proceedings Zool. Soc., 1834, p. 7. Deshayes, Note in new edition of Lamarck, p. 451. Müller, Syn. Test., p. 50. No. 9. *a*.

Phasianella inflexa, De Blainville.

Pl. CCIX. Fig. 2.

EULIMA LABIOSA, Sowerby, Proceedings Zool. Soc., 1834, p. 7. Deshayes, Note in new edition of Lamarck, p. 452. Müller, Syn. Test., p. 50. No. 9.

Pl. CCIX. Fig. 3.

EULIMA SUBANGULATA, Sowerby, Proceedings Zool. Soc., 1834, p. 8. Deshayes, in new edition of Lamarck, p. 454. Müller, Syn. Test., p. 50. No. 10.

Pl. CCIX. Fig. 4.

EULIMA IMBRICATA, Sowerby, Proceedings Zool. Soc., 1834, p. 7. Müller, Syn. Test., p. 49. No. 4.

Bonellia imbricata, Deshayes.

Pl. CCIX. Fig. 5.

EULIMA POLITA, Deshayes, Note in new edition of Lamarck, p. 453.

Turbo politus, Linnæus.

Helix polita, Pennant.

Eulima Anglica, Sowerby.

Melania Boscii, Payrandeau.

Rissoa Boscii, Philippi.

Pl. CCIX. Fig. 6.

EULIMA PUSILLA, Sowerby, Proceedings Zool. Soc., 1834, p. 8. Deshayes, Note in new edition of Lamarck, p. 455. Müller, Syn. Test., p. 50. No. 11.

Plate CCIX.

Eulina.

1. *Scalaria pretiosa.*
2. ... .*Clathrus.*
3 ....*raricosta.*
4 *australis*
5 *foliacea.*

SCALARIA, Lamarck.

Testa turriculata, plerumque candidissima, anfractibus segregatim volutis, costis elevatis, plus minusve numerosis, circumcinctis; aperturâ rotundâ, margine continuo, reflexo, interdum subexpanso, basi obsoletè canaliculatâ. Operculum corneum, tenue, spirale.

Amongst the crude conceptions of the early naturalists was a genus proposed by Klein under the title of *Scala*, for the purpose of associating all turriculated shells that have the volutions in any way ribbed or ringed. The well-known *Scalaria pretiosa* was to be regarded as the type; Linnæus referred it to his genus *Turbo*; but Lamarck, in taking it with its cognate species under a more limited character, proposed the present genus for their reception, with the new appellation of Scalaria. The Scalariæ have now become numerous, and their shell is especially distinguished by the elegance and regularity of its growth. The simplicity of its formation is indeed remarkable, for the entire shell is nothing more than a gradually enlarging tube, spirally twisting as it increases, and becoming periodically encircled with ribs, which exhibit no specific determination of growth, because each in its turn forms the margin of the aperture.

The shell of Scalaria may be further described as being turriculated, and generally very white; the aperture is round, the margin being continuous, reflected, sometimes a little expanded, and obsoletely canaliculated at the base. The operculum is thin, horny, and spiral.

Examples.

Pl. CCX. Fig. 1.

Scalaria pretiosa, Lamarck, Anim. sans vert., vol. vi. part 2. p. 226. Encyclopédie Méthodique, pl. 451. f. 5. *a*, *b*.

Turbo scalaris, Linnæus.

Pl. CCX. Fig. 2.

SCALARIA CLATHRUS, Sowerby, Genera of Shells, No. 11.
Turbo clathrus, Linnæus.

Pl. CCX. Fig. 3.

SCALARIA RARICOSTA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 228.

Pl. CCX. Fig. 4.

SCALARIA AUSTRALIS, Lamarck, Anim. sans vert., vol. vi. part 2. p. 228.

Pl. CCX. Fig. 5. (fossil.)

SCALARIA FOLIACEA, Sowerby, Genera of Shells, No. 11.

DELPHINULA, Lamarck.

Testa turbinata, subdiscoidea, intrò margaritacea, anfractibus sæpè laxè volutis, ultimo prominente, spinis retusis plerumque ornatis, umbilicum amplum formantibus; aperturâ integrâ, rotundâ, margine continuo, subreflexo. Operculum corneum, spirale.

The Delphinulæ were of the number of those mollusks which were separated from the *Turbines* by Lamarck for the formation of his genus *Cyclostoma*; but when he discovered the manifest impropriety of associating in one and the same genus a set of animals differing so entirely both in their organization and habits, he instituted the desirable separation which had been in a manner conceived by Chemnitz, when he distinguished them by the common title of *Delphinus*. The genus Delphinula was introduced for the reception of such of these *Cyclostomata* as he found to be marine; they differ, therefore, in being hydrobranchiate, as well as in the composition and external ornament of their shells.

The shell of Delphinula may be described as being turbinated, somewhat discoid, and pearly within, the whorls being often loosely rolled, with the last rather prominent; they are for the most part ornamented with blunt spines, and form a large umbilicus; the aperture is entire

Plate CCXI.

G.B.S. Junr.

and rounded, with the margin continuous and somewhat reflected. The operculum is horny and spiral.

Examples.

Pl. CCXI. Fig. 1 and 6.

DELPHINULA TYRIA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXI. Fig. 2.

DELPHINULA NODOSA, *Nobis*, Proceedings Zool. Soc., 1842.
Delphinus nodosus, Chemnitz, vol. v. p. 160. pl. 174. f. 1723 and 1724.

Pl. CCXI. Fig. 3.

DELPHINULA DISTORTA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 231.
Delphinus ruber distortus, Chemnitz, Conch., vol. v. p. 161. pl. 175. f. 1737 to 1739.

Pl. CCXI. Fig. 4, and Pl. CCXII. Fig. 10.

DELPHINULA MELANACANTHA, *Nobis*, Proceedings Zool. Soc., 1842.
Delphinula laciniata, Sowerby, Genera of Shells, No. 39.

Pl. CCXI. Fig. 5, and Pl. CCXII. Fig. 7.

DELPHINULA LACINIATA, Lamarck, Anim. sans vert., vol. vi. part 2. p. 230. Encyclopédie Méthodique, pl. 451. f. 1. *a*, *b*. Chemnitz, Conch., vol. v. pl. 175. f. 1733 to 1735.
Turbo delphinus, Linnæus.

Pl. CCXII. Fig. 8.

DELPHINULA ACULEATA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXII. Fig. 9.

DELPHINULA FORMOSA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXII. Fig. 11.

DELPHINULA INCISA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXII. Fig. 12.

DELPHINULA ATRATA, *Nobis*, Proceedings Zool. Soc., 1842.
Delphinus atratus, Chemnitz.

SOLARIUM, Lamarck.

Testa circularis, subdiscoidea, depresso-conica, anfractibus plurimis, peripheriâ acutâ, in spiram planiusculam convolutis, umbilicum spiralem, amplissimum formantibus, anfractuum margine interno crenato; aperturâ trapeziformi, labro simplici acuto. Operculum corneum, subspirale.

The genus Solarium is one that was introduced by Lamarck in distributing the Linnæan *Trochi*, and it has been adopted without alteration by all succeeding writers. There are few mollusks, indeed, whose shells present a more distinct peculiarity of structure than those of the Solaria; they are all of a circular depressed form, and are composed of a number of slowly enlarging whorls, resting one upon the other in such exact order, that they form on the inner side a wide, open, spiral umbilicus. The progress of the whorls is, in fact, marked with such exceeding regularity of growth, that upon looking into the umbilicus before a strong light, it exhibits almost a perspective illusion.

The shell of Solarium may be further described as being of the form of a flat, depressed cone, consisting of a number of whorls, which are sharp round the outer edge, whilst the inner edge is always crenated; the aperture is trapeziform, and the lip is simple and acute. The operculum is horny and somewhat spiral.

Examples.

Pl. CCXIII.

SOLARIUM PERSPECTIVUM, Lamarck, Anim. sans vert., vol. vii. p. 3. Encyclopédie Méthodique, pl. 446. f. 1. *a*, *b*.
Trochus perspectivus, Linnæus.

Solarium perspectivum.

PHORUS, De Montford.

Testa orbicularis, subconica, spirâ obtusâ, anfractibus regularibus, peripheriâ tubulis cavis interdum ornatâ, lapidum aut conchyliorum frustis plus minusve agglutinatis; facie infernâ concaviusculâ, granosâ aut lamellosâ; umbilico amplo, profundo, sæpè ætate occultato; aperturâ depressâ, marginibus disjunctis, labro simplici, acuto. Operculum corneum, tenue, ovale.

It is remarkable that a group of mollusks of such decided importance as the present should have been so long neglected by naturalists; the genus Phorus was introduced many years since by De Montford in the attempt which he made in his 'Conchiliologie Systématique' to establish a new generic distribution of shells; and it may be deservedly followed. We have little acquaintance with the nature or anatomy of the Phori, but can sufficiently estimate the remarkable character which the shells exhibit to rest their claim upon that alone to the rank of a genus. The character we allude to is a property which this mollusk possesses of agglutinating to the outer surface of its shell any fragments of stones, shells, corals or other marine debris that it happens to be in contact with, and which become so firmly attached that they cannot be separated without violence. The well-known Carrier Trochus, the type of the genus, was for a long time the only species of Phorus known*; when others even were discovered, they were only regarded as varieties of the same; and this agglutinating property was not considered of sufficient importance to warrant its adoption. But the distinction which De Montford assigned

* We agree with De Montford in selecting the *Carrier Trochus* for the formation of a genus, but do not at present see any necessity for altering the situation of it in the natural system; the structure and formation of the shell, as well as the presence of an operculum, sufficiently indicate that it is allied to the true *Trochi*, and not to the *Calyptrææ*, as supposed by Gray.

to them has become of infinite value, for we now have species in which this peculiarity operates in different forms; some, for example, are found with merely a few small pebbles agglutinated to the earlier whorls, whilst others have nothing but flat, tile-shaped pieces collected only round the periphery of the whorls. We doubt not but that other modifications of this character will yet be discovered, and we trust that the Phori will ere long be made the subject of a strict anatomical examination; the genus is undoubtedly one of interest, and cannot fail to be esteemed by conchologists.

The shell of Phorus may be described as being orbicular, nearly conical, and obtuse at the spire; the whorls are of regular formation, are more or less agglutinated over with fragments of stones or shells, and have the periphery sometimes ornamented with long hollow spines; the under face of the shell is rather concave, granular or lamellated, and there is a large deep umbilicus, which is, however, often concealed by age; the aperture is depressed, with the margins disjoined, and the lip simple and acute. The operculum is thin, horny and oval.

Examples.

Pl. CCXIV. Fig. 1 and 2.

Phorus solaris, *Nobis*, Proceedings Zool. Soc., 1842.
Trochus solaris, Linnæus. Chemnitz, Conch., vol. v. t. 173. f. 1700 and 1701. Lamarck, Anim. sans vert., vol. vii. p. 10.

Pl. CCXIV. Fig. 3, and Pl. CCXV. Fig. 8.

Phorus onustus, *Nobis*, Proceedings Zool. Soc., 1842.
Trochus agglutinans, Lamarck, Anim. sans vert., vol. vii. p. 14.
Trochus conchyliophorus, Born.

Pl. CCXIV. Fig. 4.

Phorus pallidulus, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXIV. Fig. 5.

Phorus corrugatus, *Nobis*, Proceedings Zool. Soc., 1842.

Plate CCXIV.

G.B.S. Jun.r

Plate CCXV.

G.B.S. Junr

Pl. CCXV. Fig. 6.

PHORUS INDICUS, *Nobis*, Proceedings Zool. Soc., 1841.
Trochus Indicus, Wagner, Supp. to Chemnitz, pl. 229. f. 4062. *a*, *b*.

Pl. CCXV. Fig. 7.

PHORUS CALCULIFERUS, *Nobis*, Proceedings Zool. Soc., 1841.

Pl. CCXV. Fig. 9 and 10.

PHORUS EXUTUS, *Nobis*, Proceedings Zool. Soc , 1841.

ROTELLA, Lamarck.

Testa orbicularis, subdiscoidea, plerumque nitida, utrinque convexa, spirâ brevissimâ, facie infernâ callosâ, umbilico nullo; aperturâ semilunari, marginibus disjunctis, labro simplici, acuto, basi subprominente. Operculum corneum, spirale, orbiculare.

The Linnæan *Trochus vestiarius*, with the few species allied to it, a small group of mollusks distinguished by the equi-convexity of their shells, were selected by Lamarck for the formation of this genus. They had been already set apart by De Montford under the generic title of *Pitonillus*; but as this author had confounded certain species of *Helicinæ* with them, attracted by a slight similitude in the formation of their shells, without regarding the important difference in their organization and habits, the name of *Pitonillus* was very properly abandoned for that of Rotella in order to escape confusion. De Blainville, considering the Rotellæ merely as a sectional subdivision of the genus *Trochus*, for a long time refused to acknowledge the rank that was assigned to them by Lamarck and his numerous followers; he however subsequently admitted the propriety of it, and now there are not two opinions on the subject.

The shell of Rotella may be described as being orbicular, nearly dis-

coid, generally shining, and convex on both sides, the spire being very short, and the under surface of the shell hard and callous, without any trace of an umbilicus; the aperture is semilunar, with the margins disjoined, and the lip simple and acute. The operculum, which is of an orbicular form, is horny and spiral.

Examples.

Pl. CCXVI. Fig. 1.

ROTELLA MONILIFERA, Lamarck, Anim. sans vert., vol. vii. p. 8. Gualt. Test., pl. 65. f. E.

Pl. CCXVI. Fig. 2.

ROTELLA VESTIARIA, Sowerby, Genera of Shells, No. 14. Favanne, Conch., pl. 12. f. G.

Trochus vestiarius, Linnæus.

Rotella lineolata, Lamarck.

Pl. CCXVI. Fig. 3.

(Variety of the same, magnified.)

TROCHUS, Linnæus.

Testa conica, pyramidalis, subtùs planiuscula; spirâ elatâ, anfractibus depressis, peripheriâ plus minusve acutâ; columellâ arcuatâ, ad basem sæpè truncatâ, seu dentatâ, nonnunquam crenatâ; marginibus disjunctis, labro acuto, vel simplici, vel denticulato. Operculum nunc corneum, nunc calcareum.

In contemplating the great theory of Nature it is everywhere manifest that she cannot be made strictly subject to arbitrary division; her movements and developments exhibit such an exhaustless love of variety, that in their multitude of forms and modifications an easy affinity is established between the highest and the lowest state of organization; between man

ROTELLA.

Plate CCXVI.

1. *Rotella monilifera.*
2. ... ... *vestiaria.*
3. ... ... *aucta.*

and the animalcule. We class her operations, as naturalists, in systematic or comparative order, and to enable our memory to recur with facility to any one of them, institute a scale of divisions, giving to every one a name; but we cannot determine their exact limits,—their legitimate endings or beginnings; for Nature is ever variable, never twice alike;—she is not bound by mathematical exactness. Why then should the long-established distinction between the *Trochi* and the *Turbines* be abandoned merely because we have met with the intermediate forms which exhibit that gradual passage from the one genus to the other, which will sooner or later be found to exist between every division throughout the system? So far as concerns the organization or habits of these mollusks, they are scarcely found to differ from each other; Linnæus distinguished them as separate genera on account of the marked difference in the structure of their shells; referring such as are characterized by having a conical, pyramidal shell, flat at the base, to the genus *Trochus*, and those in which it is of a turbinated, top-shaped form to the genus *Turbo*. Both genera were followed in this form by Lamarck, after setting apart so many species from them as seemed to offer special claims for the formation of new ones; but when their intermediate varieties were discovered, De Férussac as well as Deshayes proposed to unite the two genera into one, whilst De Blainville at the same time retained them in separate families; the *Trochi* with his *Goniostomata*, the *Turbines* with his family *Cricostomata*. The most novel, but, we fear, fallacious attempt to improve the subdivision of these mollusks, is that introduced by Sowerby. After throwing the *Trochi* and *Turbines* together, he proposes to divide them according to the difference in the composition of their opercula, referring those that have a horny operculum to *Trochus*, and those that have a calcareous one to *Turbo*. Our author could not, however, have selected a character of a more uncertain nature, nor one which could involve the arrangement in greater confusion; it is undoubtedly important to observe whether a mollusk is operculated or not, but we find no laws, or set of characters accompanying this strange variation in the composition of the operculum; the *Trochus virgineus*, for example, which has a true pyramidal shell, is furnished with a very thin, horny operculum, whilst the *Trochus cælatus*, which

agrees with it in every character of form, &c., has a solid calcareous one; the *Turbo pica*, again, has a horny operculum, whilst the *Turbo sarmaticus* has a calcareous one.

To avoid confusion, therefore, we preserve the genera Trochus and *Turbo* in their integrity, relying upon the practicability of dividing the species with tolerable accuracy according to the shape and formation of their shells. The columellar tooth, by which Lamarck distinguished his *Monodontæ*, is of such wide and uncertain application that we have abandoned that genus as unnecessary, in imitation of Sowerby and Deshayes, and we restore the genus *Phorus* of De Montford, for the reasons already given in treating of it. Other genera proposed by this author, *Calcar* for the *Trochus stellaris*, *Tectus* for the *Trochus maculatus*, *Cantharidus* for the *Trochus iris*, and *Clanculus* for the *Trochus Pharaonis*, and those allied to it, we cannot so highly appreciate.

The shell of Trochus may be described as being conical, pyramidal, and flattish underneath; the spire is elevated, and the whorls, which are rather numerous, have their periphery more or less acute; the columella is curved, and often truncated or dentated at the base, sometimes it is crenated; the margins are disjoined, and the lip is sharp, and either simple or denticulated. The operculum is sometimes horny, sometimes calcareous.

Examples.

Pl. CCXVII. Fig. 1.

Trochus triserialis, Lamarck, Anim. sans vert., vol. vii. p. 22. Delessert, Recueil de Coquilles, pl. 35. f. 7. *a*, *b*.

Pl. CCXVII. Fig. 2.

Trochus calcar, Chemnitz, Conch., vol. v. p. 48. pl. 164. f. 1554 to 1557.

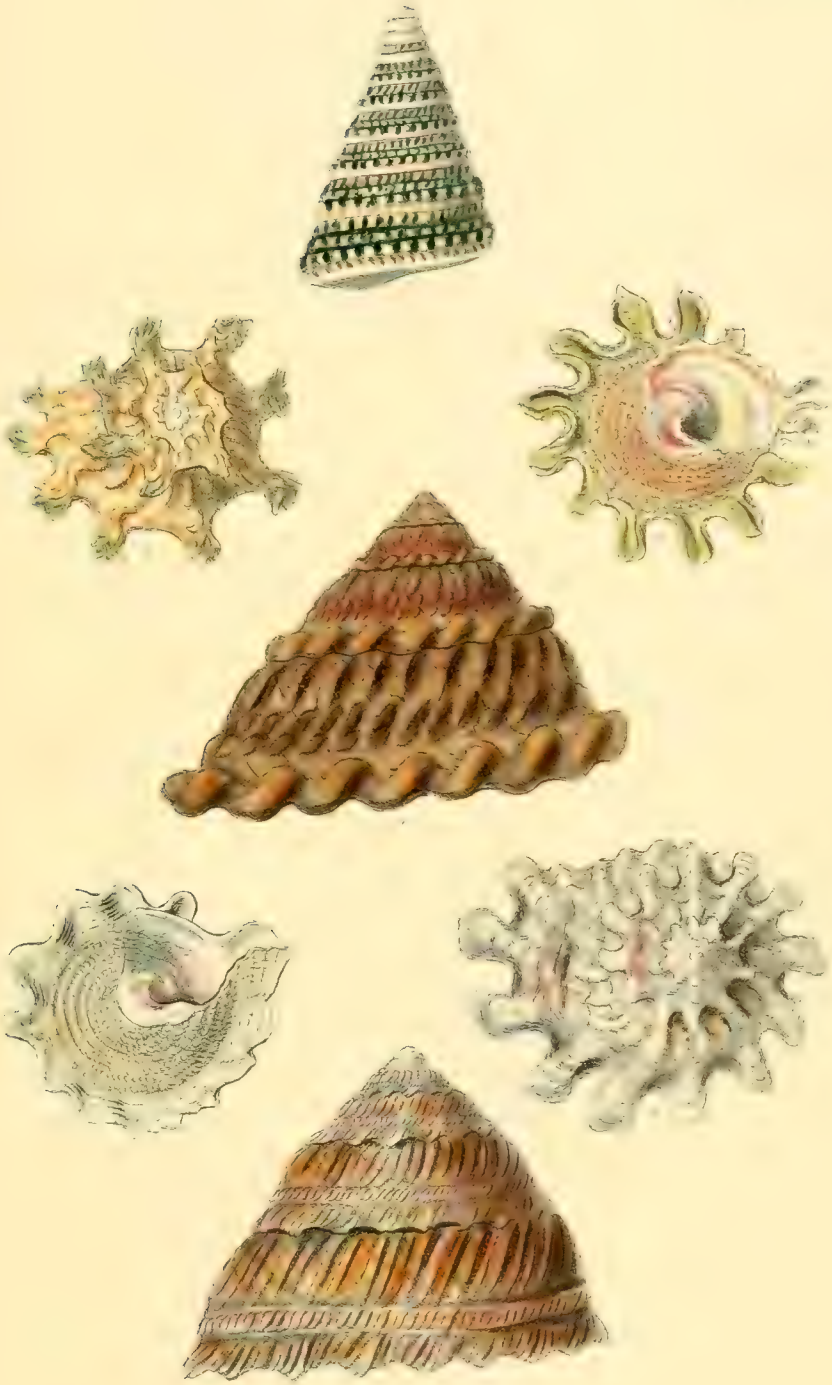
Pl. CCXVII. Fig. 3.

Trochus asteriscus, *Nobis*, Proceedings Zool Soc., 1842.

Pl. CCXVII. Fig. 4.

Trochus undosus, Wood., Supp. Index Testaceologicus, pl. 5. f. 1.

Plate CCXVII.



G.B.S. Junr.

Plate CCXVIII.

G.B.S. Jun.r

Pl. CCXVII. Fig. 5.

TROCHUS PILEOLUM, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVII. Fig. 6.

TROCHUS UNGUIS, Wood, Supp. Index Testaceologicus, pl. 5. f. 2.

Pl. CCXVII. Fig. 7.

TROCHUS OLIVACEUS, Wood, Supp. Index Testaceologicus, pl. 5. f. 3.

Pl. CCXVIII. Fig. 8.

TROCHUS CARINIFERUS, Beck, MSS.?

Pl. CCXVIII. Fig. 9.

TROCHUS GEMMOSUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVIII. Fig. 10.

TROCHUS ANNULATUS, Martyn, Univ. Conch., pl. 33. Lamarck, Anim. sans vert., vol. vii. p. 25.
Trochus virgineus, Chemnitz.

Pl. CCXVIII. Fig. 11.

TROCHUS HANLEYANUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVIII. Fig. 12.

TROCHUS EXIMIUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVIII. Fig. 13.

TROCHUS ORNATUS, Lamarck, Anim. sans vert., vol. vii. p. 27. Delessert, Recueil de Coquilles, pl. 35. fig. 3. *a*, *b*, *c*.

Pl. CCXVIII. Fig. 14.

TROCHUS MODESTUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVIII. Fig. 15.

TROCHUS JAVANICUS, Lamarck, Anim. sans vert., vol. vii. p. 25. Delessert, Recueil de Coquilles, pl. 35. f. 2. *a*, *b*.

Pl. CCXVIII. Fig. 16.

TROCHUS MELANOSTOMA, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXVIII. Fig. 17.

TROCHUS GUILDFORDIÆ, *Nobis*.
*Imperator Guildfordiæ**, Gray, MSS. British Museum.

TURBO, Linnæus.

Testa turbinata, solida, intus plerumque vel argenteo-, vel aureo-margaritacea, anfractibus convexis, nunquam depressis, extus aut rugosa, aut glabra; aperturâ rotundâ, columellâ arcuatâ, planulatâ, non truncatâ; marginibus disjunctis, labro seu simplici, seu denticulato. Operculum nunc corneum, nunc calcareum.

Our observations on the preceding genus apply so fully to the present, that little need be added. The genus Turbo was introduced by Linnæus, and has been from time to time divested of the *Delphinulæ*, the *Scalariæ*, the *Littorinæ*, the *Turritellæ*, the *Cyclostomata*, and a few others. The Turbines having for the most part a much larger and more solid shell than the *Trochi*, the operculum is generally calcareous.

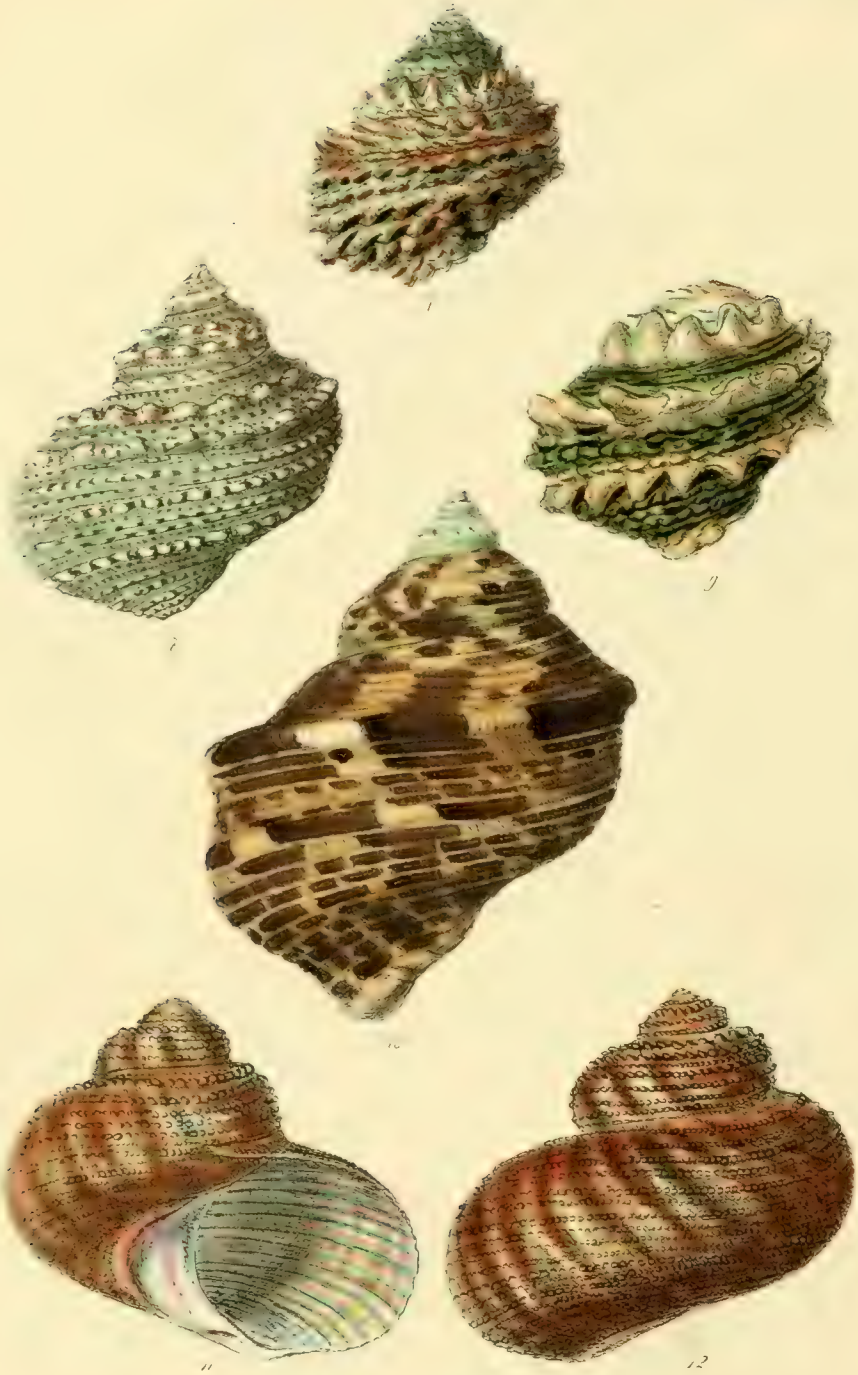
The shell of Turbo, which is sometimes highly polished, sometimes covered with a thick periostraca, may be described as being turbinated, and generally pearly within; the whorls are convex and never depressed; the aperture is round, and the columella is curved, flattish, and not trun-

* As the greater part of Mr. Gray's species are known only in manuscript, we gladly embrace the opportunity of giving a very excellent one publicity.

Plate CCXIX.

G.B.S. Jun.

Plate CCXX.



cated; the margins are disjoined, and the lip is either simple or denticulated. The operculum is sometimes horny, sometimes calcareous.

Examples.

Pl. CCXIX. Fig. 1 and 2.

TURBO VARIABILIS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXIX. Fig. 3.

TURBO PULCHER, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXIX. Fig. 4.

TURBO PETHOLATUS, Linnæus, Syst. Nat. (Gmelin), p. 3590. Lamarck, Anim. sans vert., vol. vii. p. 43.

Pl. CCXIX. Fig. 5.

TURBO SPENGLERIANUS, Gmelin, Syst. Nat., p. 3595. Chemnitz, Conch., vol. v. pl. 181. f. 1801 and 1802.

Pl. CCXIX. Fig. 6.

TURBO TICAONICUS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXX. Fig. 7.

TURBO SQUAMIGER, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXX. Fig. 8.

TURBO MOLTKIANUS, Chemnitz, Conch., vol. v. p. 205. pl. 181. f. 1799 and 1800.

Pl. CCXX. Fig. 9.

TURBO CORONATUS, Gmelin, Syst. Nat., p. 3594. Chemnitz, Conch., vol. v. pl. 180. f. 1791 and 1792. Encyclopédie Méthodique, pl. 448. f. 2. *a*, *b*.

Corona reclusa, Chemnitz.

Pl. CCXX. Fig. 10.

TURBO CRASSUS, Wood, Index Testaceologicus, Supp., pl. 6. f. 43.

Pl. CCXX. Fig. 11 and 12.

TURBO RUBICUNDUS, *Nobis*, Proceedings Zool. Soc., 1842.

Cochlea rubicunda, Chemnitz, Conch., vol. v. p. 207. pl. 181. f. 1803 and 1804.

Turban à robe granuleuse, Favanne.

The rock-beaded Trochus, Humphrey.

MARGARITA, Leach.

Testa turbinata, spirâ brevi, acutâ; anfractibus rotundis, umbilicum amplum sæpissimè formantibus; aperturâ orbiculari, marginibus disjunctis, labro simplici, tenui, acuto. Operculum corneum, spirale.

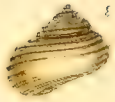
The genus Margarita was instituted by Leach, and is so nearly allied to *Trochus*, that we should hardly have thought it necessary to adopt it, had it not been that the interesting number of shells lately referred to this little group by King and Sowerby exhibit a peculiarity of character throughout by which they may be readily identified. The greatest variation of character in the shells of the Margaritæ appears to be in the presence or absence of an umbilicus; for whilst some of them offer no trace of being umbilicated, there are many in which the umbilicus is so large that they look more like the land *Cyclostomata*.

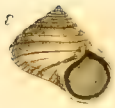
The shell of Margarita may be further described as being turbinated, and having a short, sharp-pointed spire; the aperture is orbicular, and the margins are disjoined, with the lip thin, simple and acute. The operculum is horny and spiral.

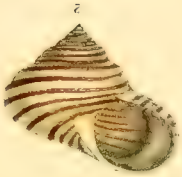
Examples.

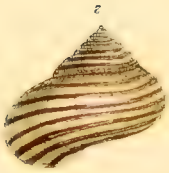
Pl. CCXXI. Fig. 1.

MARGARITA SULCATA, Sowerby, Conch. Illus. Cat., No. 11.









Pl. CCXXI. Fig. 2.

MARGARITA TÆNIATA, Sowerby, Conch. Illus. Cat., No. 1.
Trochus bicolor, Lesson.

Pl. CCXXI. Fig. 3.

MARGARITA STRIATA, Broderip and Sowerby, Zool. Journ., vol. iv. p. 371.

Pl. CCXXI. Fig. 4.

MARGARITA UNDULATA, Sowerby, Conch. Illus. Cat., No. 12.

LITTORINA, De Férussac.

Testa turbinata, spiralis, solidiuscula, spirâ acuminatâ; apertura rotundâ, aut semilunari; columellâ planulatâ; marginibus disjunctis, labro acuto, interdum subexpanso. Operculum corneum, spirale.

When the Littorinæ were grouped together by De Férussac, he considered them merely as a subgenus of *Paludinæ*; but the important difference in the habits of these mollusks is alone sufficient to warrant the separation we have adopted. Having for the most part a solid, turbinated shell like others of the same marine nature, they were included by Linnæus in his genus *Turbo*; and Lamarck followed the same method of arrangement, forgetting that several new species, which he described as *Phasianellæ*, present a strong generic affinity with the *Turbo littoreus* of his predecessor.

The shell of Littorina may be described as being turbinated, spiral, rather solid, and acuminated at the spire; the aperture is either round or semilunar, the columella is flat, and the margins are disjoined, with the lip acute, and sometimes a little expanded. The operculum is horny and spiral.

Examples.

Pl. CCXXII. Fig. 1.

LITTORINA VULGARIS, Sowerby, Genera of Shells, No. 37.
Turbo littoreus, Linnæus. Lamarck.
Littorina littorea, De Férussac.

Pl. CCXXII. Fig. 2 and 3.

LITTORINA PULCHRA, Sowerby, Genera of Shells, No. 37.
Turbo pulcher, Swainson.

Pl. CCXXII. Fig. 4.

LITTORINA VARIA, Sowerby, Genera of Shells, No. 37.

Pl. CCXXII. Fig. 5.

LITTORINA FILOSA, Sowerby, Genera of Shells, No. 37.

Pl. CCXXII. Fig. 6.

LITTORINA OBESA, Sowerby, Genera of Shells, No. 37.

PHASIANELLA, Lamarck.

Testa ovato-oblonga, lævis, polita, spirâ regulari, elatâ; aperturâ ovali posticè plus minusve angulatâ; columellâ lævi, depressâ, versùs marginem basalem attenuatâ; labro simplici, acuto, nunquam reflexo, parte inferiori interdum incrassato. Operculum calcareum, extùs læve, convexum, intùs infernè spirale.

The genus Phasianella was introduced by Lamarck; and after removing some of that author's species of it to *Littorina*, it is perhaps as well defined as any of the series. The Phasianellæ may be recognized either by their shell, or their operculum, both having a peculiarity of their own: the shell, which is as highly polished as porcelain, is always most delicately

3. its operculum.

1 & 2 Phasianella varia.
3 ... Princeps
4. ..... Pullus.

and profusely painted; and the operculum, which is always calcareous, so far, at least, as we know at present, is curiously smooth and convex on the outside, and spiral within. There are several species of them, and it is remarkable that they are all from the continent of New Holland.

The shell of Phasianella may be described as being ovately-oblong, smooth and polished, with a regular elevated spire; the aperture is oval, but more or less angulated at the upper part; the columella is smooth, depressed, and attenuated towards the basal margin; the lip is simple, acute, and never reflected, the lower part being sometimes thickened. The operculum is calcareous and smooth, convex on the outside and spiral within.

Examples.

Pl. CCXXIII. Fig. 1 and 2.

PHASIANELLA VARIA, Encyclopédie Méthodique, pl. 449. f. 1. *a*, *b*, *c*. Sowerby, Genera of Shells, No. 4.
Buccinum Novæ-Zelandiæ, Favanne.
Buccinum Tritonis, Chemnitz.
Buccinum australe, Gmelin.
Phasianella bulimoides, Lamarck.

Pl. CCXXIII. Fig. 3.

(A fossil species of *Littorina*, inserted inadvertently.)

Pl. CCXXIII. Fig. 4.

PHASIANELLA PULLUS, Sowerby, Genera of Shells, No. 4.
Turbo pullus, Linnæus. Lamarck.

TURRITELLA, Lamarck.

Testa turrita, longissima, angusta, anfractibus numerosis, in spiram gracilem confertim volutis; columellâ lævi, arcuatâ; aperturâ subro-

tundâ, marginibus disjunctis, labro acuto, sinu interdum leviter emarginato.

We have now to consider a genus of mollusks, which Lamarck separated from the Linnæan *Turbines* on account of the great length to which their shell is extended by its multiplicity of volutions. Commencing from a point, it gradually enlarges to six or seven inches in length, whilst the diameter at the broadest part is under one inch. The Turritellæ are very closely allied to the *Turbines*, but have nevertheless been somewhat removed from them by De Blainville, in placing them between the *Delphinulæ* and the *Scalariæ*. If it were not that the margins of the aperture in the shell of Turritella were disjoined in such a manner as to exhibit a distinct columella, we might certainly appreciate this arrangement: in both those genera the margins of the aperture are continuous, and the volutions of the shell are so independent of each other as not to allow of the formation of a columella; they cannot, therefore, be well admitted in such close affinity, though undoubtedly belonging to one and the same family.

The shell of Turritella may be described as being turrited, very long, and narrow, composed of a number of whorls closely rolled into a sharp-pointed spire, forming at the aperture in all stages of growth a smooth, curved columella; the aperture is nearly round, with the margins disjoined; and the lip is simple, acute, and sometimes slightly emarginated with a sinus.

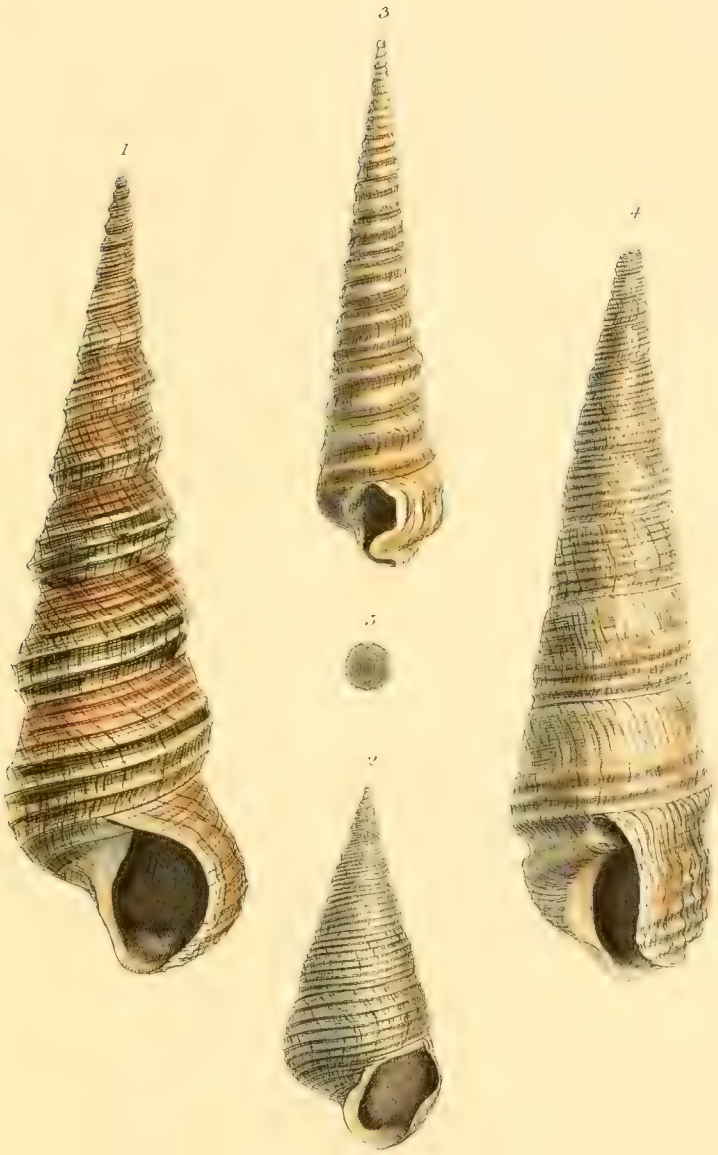
Examples.

Pl. CCXXIV. Fig. 1.

TURRITELLA DUPLICATA, Lamarck, Anim. sans vert., vol. vii. p. 56. Encyclopédie Méthodique, pl. 449. f. 1. *a*, *b*.
Turbo duplicatus, Linnæus.

Pl. CCXXIV. Fig. 2. (fossil.)

TURRITELLA SULCATA, Lamarck, Anim. sans vert. Supp., vol. vii. p. 561.



1. *Turritella duplicata*
2. ..... *sulcata*
3. ..... *exoleta*
4. *sinuosa*

Pl. CCXXIV. Fig. 3.

TURRITELLA EXOLETA, Lamarck, Anim. sans vert., vol. vii. p. 58.
Turbo exoletus, Linnæus.

Pl. CCXXIV. Fig. 4. (fossil.)

TURRITELLA SINUOSA, Sowerby, Genera of Shells, No. 12.

Family 7. PARASITICA.

Animal marinum, parasiticum, pallio crasso, cyathiformi, testæ anfractus ultimos obtegente.

We introduce this family with the name of Parasitica for the sake of distinguishing the peculiar habits and organization of a group of small parasitical mollusks, which have been associated together by Broderip under the common generic title of *Stylifer*. They are called parasites, in the technical meaning of the word, because they live upon the juices of other invertebrated animals, Radiata, Echini, &c., being found either attached to, or directly imbedded in, particular parts of them; and their shells present all the transparent glassy nature of being internal. The *Styliferi* are said by Broderip to be most remarkable for the peculiar form and disposition of their mantle; he describes it as being thick, very large, and of the shape of a cup, completely enveloping the last whorl of the shell; Gray, however, in noticing this mollusk in the Zoology of Beechey's Voyage, says, that that organ is the foot, although Broderip further observes, that he has traced the rudiment of a foot upon the ventral aspect of the mantle: we much regret that we have not the means of determining this question.

The only species at present known of this curious family of mollusks are included in the following genus,

STYLIFER.

STYLIFER, Broderip.

Testa hyalina, pellucida; vel globosa, anfractibus paucis, spirâ brevissimâ; vel elongata, anfractibus plurimis, spirâ turriculatâ; apice elato, obtuso, interdum irregulariter contorto; aperturâ subovatâ, supernè acutâ; labro simplici, tenuissimo, leviter sinuato.

The genus Stylifer was instituted by Broderip for the reception of the little parasitical mollusk just described, upon the arrival of some specimens collected by Mr. Cuming imbedded in the soft parts of a star-fish, admirably showing it *in situ*. The shell of the Styliferi, of which we have two distinct formations, has been long known to naturalists. The first mention we find made of it is by Chemnitz, who has described and figured a turriculated species in his 'Conchology,' vol. xi. p 286. pl. 210. f. 2084 and 2085, under the name of *Helix corallina*, though he appears very undetermined as to whether it might be a marine or a land shell. A globose species found attached to the spines of an Echinus was then described by Turton under the title of *Phasianella stylifera*, so that this author was as ignorant of the true nature and habits of its animal inhabitant as Chemnitz: Fleming referred it to the genus *Velutina*; but, in evident doubt of the propriety of this arrangement, he at the same time suggested that a new one might be established for its reception with the name of *Stylina*.

The shell of Stylifer may be described as being hyaline, pellucid, and either globose, of few whorls, with a very short spire, or elongated, of many whorls, with a turriculated spire, the apex in both forms being curiously elevated, obtuse, and sometimes irregularly bent or twisted: the aperture is nearly ovate, but acute at the upper part; the lip is simple, very thin, and slightly sinuated.

Examples.

Pl. CCXXV. Fig. 1.

STYLIFER SUBULATUS, Broderip. Sowerby, Genera of Shells, No. 38.

Plate CCXXV.

Fig. 1. Stilifer subulatus.
Fig. 2. Astericola.

Pl. CCXXV. Fig. 2 and 3.
(The same magnified.)

Pl. CCXXV. Fig. 4.
STYLIFER ASTERICOLA, Broderip. Sowerby, Genera of Shells, No. 38.

Pl. CCXXV. Fig. 5.
(Portion of Star-fish, showing the same imbedded therein.)

Pl. CCXXV. Fig. 6 and 7.
(The same magnified.)

ANATOMY OF STYLIFER ASTERICOLA.

(Communicated by Prof. Owen.)

Pl. CCXXV.

Fig. 8. *a*. Anterior or oval aperture in the reflected portion of the mantle.
b. Thickened margin of the reflected portion of the mantle.
Fig. 9. *a*. Margin of the reflected fold of the mantle.
b, *b*. Lobes of the foot.
c. Visceral mass protected by the shell.
Fig. 10. *a*. Margin of the reflected fold of the mantle.
b. Apex of the visceral mass formed by the generative organ.
c. Retracted mouth.
d. Base of the visceral mass formed by the liver and intestine.
e, *e*. Tentacles.
Fig. 11. *a*. Ovarium, and part of the oviduct.
b. Mass of liver and intestine.
c. Mucous glands attached to the mantle which secrete the nidus of the ova.
Fig. 12. *a*. Testis.
b. Glandular vas deferens.
c. Mass of liver and intestine.
d. The two pectinated branchiæ.

Family 8. CANALIFERA.

Testa canaliculata, canali plus minusve elongato, interdum brevissimo; anfractibus varicibus interdum ornatis, labro ætate non mutabili; columellâ interdum plicatâ.

The Canalifera are very numerous, and constitute an interesting family of mollusks: they are distinguished, first, in being armed with a strong retractile proboscis for the capture of prey; and secondly, in having a siphon of various length for the purpose of conveying the water freely to the branchial cavity. The last of these peculiarities exercises the greatest influence on the formation of the shell, for it is always more or less canaliculated at the base for the protection or passage of that organ.

Lamarck was the first to separate this portion of the zoophagous Gasteropoda under the title of Canalifera; De Blainville nearly followed his example, substituting the word *Siphonostoma*; but Latreille divided the family into two. He proposed that the fusiform genera, in which the shell is mostly plaited on the columella, should be separated under the name of *Fusiformia*, and that those in which the shell is ornamented with varices should be set apart under that of *Varicosa*. We have, however, followed Lamarck in determining this family upon the sole character of the basal canal which the shells exhibit for the passage of the siphon; they undoubtedly present an immense diversity of form, but may nevertheless be fairly distributed without further subdivision into the following ten genera:

Cerithium.	Pleurotoma.
Turbinellus.	Pyrula.
Cancellaria.	Murex.
Fasciolaria	Ranella.
Fusus.	Triton.

CERITHIUM, Bruguière.

Testa turriculata, extùs plerumque rugosa; anfractibus plurimis, spirâ regulari, apice subacuto, interdum eroso, seu decollato; aperturâ semirotundâ, vel oblongâ; columellâ arcuatâ, plicâ subspirali, sæpiùs reflexâ, canalis marginem superiorem formante; labro plerumque incrassato, nonnunquam latè reflexo.

We have now to describe a group of mollusks, that were assembled under the above title by Bruguière for the first time in the 'Encyclopédie Méthodique;' the word Cerithium had however been previously used in reference to some few of the species both by Adanson and Fabius Columna. They were distributed by Linnæus in the genera *Murex*, *Strombus*, and *Trochus*, but are nevertheless well characterized by the turriculated structure of their shells, which are always more or less strongly canaliculated at the base of the aperture. The Cerithia may be considered as intermediate, both in their habits and external characters, between the fusiform marine, and the fusiform freshwater kinds of this class; so much so, that many authors have been tempted to arrange them on this account in the same natural division with the *Melaniæ*. The fact is, that as many of the Cerithia are found located at the mouths of estuaries, at the confluence of rivers with the sea, and in other places where the water is brackish, their habits as well as the composition of their shells become modified in a manner similar to those of the freshwater mollusks, and they assume almost the same sombre appearance. Brongniart, considering this variation of some geological importance, proposed to separate the semi-fluviatile Cerithia from those that are strictly marine, under the new title of *Potamis*: in studying them, however, in the living state, we can attach no importance to that which, arising from only a slight modification of circumstance, produces no change in their structure or organization.

The shell of Cerithium may be described as being turriculated, generally rough on the outside, and composed of numerous whorls, forming

a regular spire, with the apex somewhat sharp, though it is sometimes eroded, or decollated; the aperture is semicircular, or oblong; the columella, which is arched, has a somewhat spiral, often reflected fold, forming the upper margin of the canal; and the lip is generally thickened, and sometimes widely reflected.

Examples.

Pl. CCXXVI. Fig. 1.

CERITHIUM BREVICULUM, Sowerby, Genera of Shells, No. 42. Kiener, Iconographie des Coquilles vivantes, pl. 15. f. 4.

Pl. CCXXVI. Fig. 4.

CERITHIUM TUBERCULATUM, Lamarck, Anim. sans vert., vol. vii. p. 75. Martini, Conch., vol. iv. pl. 157. f. 1490.
Cerithium moros, Bruguière.
Strombus tuberculatus, Linnæus.

Pl. CCXXVI. Fig. 5.

CERITHIUM VARICOSUM, Sowerby, Genera of Shells, No. 42.

Pl. CCXXVI. Fig. 8.

CERITHIUM SOVERBII *, Kiener, Iconographie des Coquilles vivantes, pl. 7. f. 2.
Cerithium clava, Gray.

Pl. CCXXVI. Fig. 9.

CERITHIUM PACIFICUM, Sowerby, Genera of Shells, No. 42.

Pl. CCXXVII. Fig. 2.

CERITHIUM DECOLLATUM, Bruguière, Dict., No. 45. Lamarck, Anim. sans vert., vol. vii. p. 71.
Murex decollatus, Linnæus.

* The word *clava* was preoccupied by Lamarck in reference to a fossil species of this genus.

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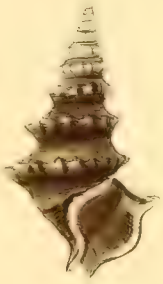


9

1 *Cerithium breviculum*
4 *tuberculatum*
5 *varicosum*
6 *Clava*
9 *Pacificum*

2 *Cerithium decollatum*
3 *sulcatum*
6 *mutatum*
7 *Columna*
10 *maculatum*

Pl. CCXXVII. Fig. 3.

CERITHIUM SULCATUM, Bruguière, Dict., No. 20. Encyclopédie Méthodique, pl. 442. f. 2.
Murex Moluccanus, Gmelin.

Pl. CCXXVII. Fig. 6.

CERITHIUM MUTATUM, Sowerby, Genera of Shells, No. 42.

Pl. CCXXVII. Fig. 7.

CERITHIUM COLUMNA, Sowerby, Genera of Shells, No. 42.

Pl. CCXXVII. Fig. 10.

CERITHIUM MURICATUM, Bruguière, Dict., No. 27. Chemnitz, Conch., vol. ix. pl. 136. f. 1267 and 1268.
Potamis muricatus, Brongniart.

TURBINELLUS, Lamarck.

Testa aut fusiformis, aut bucciniformis, solida, sæpissimè nodosa, epidermide crassâ plerumque induta; spirâ variâ, apice subobtuso; aperturâ longitudinali, angustâ; columellâ plicis tribus ad quinque compressis, transversis, ornatâ, in canalem rectum, nunc elongatum, nunc brevissimum desinente. Operculum parvum, corneum, acuminatum.

The Turbinelli, which were associated by Lamarck for the formation of this excellent genus, must have somewhat puzzled the great author of the 'Systema Naturæ;' for their shells exhibit the very characters in conjunction which he selected for the determination of his genera *Murex* and *Voluta*: like his *Murices*, their shell is canaliculated at the base, and like his *Volutæ*, it is plaited on the columella. His distribution of the Turbinelli was directed in this dilemma by their form: the long or fusiform

varieties were referred to the *Murices*; the short, or bucciniform varieties, to the *Volutæ*; it is unnecessary, however, to say how essentially they differ from both these genera as restricted in the present day. Two attempts have been made to increase the subdivision of the Turbinelli, which may perhaps be worthy of notice, although we cannot appreciate either of them. The *Turbinellus polygonus* was set apart as a type for a new genus by Schumacher under the title of *Polygonum*, and by De Montford under that of *Latirus*; the *Turbinellus scolymus* was also distinguished by Swainson under that of *Scolymus*.

The shell of Turbinellus may be described as being either fusiform, or bucciniform, solid, very often nodose, and generally covered with a thick epidermis; the spire, which varies considerably in length, is somewhat obtuse at the apex; the aperture is longitudinal, and narrow; and the columella, which has from three to five compressed, transverse plaits, ends sometimes in a long, sometimes in a very short, straight canal. The operculum is small, horny, and acuminated.

Examples.

Pl. CCXXVIII. Fig. 1 to 3.

TURBINELLUS PYRUM, Lamarck, Anim. sans vert., vol. vii. p. 104. Chemnitz, Conch., vol. xi. pl. 176. f. 1697 and 1698.

Pl. CCXXIX. Fig. 1.

TURBINELLUS VEXILLULUM, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXXIX. Fig. 2.

TURBINELLUS ACUMINATUS, Kiener, Iconographie des Coquilles vivantes, pl. 15. f. 2.

Murex acuminatus, Wood.

Pl. CCXXIX. Fig. 3.

TURBINELLUS RIGIDUS, Gray, MSS. British Museum.

Murex rigidus, Wood, Index Testaceologicus, pl. 5. f. 3.

Turbinellus Pyrum.

Plate CCXXIX.

Pl. CCXXIX. Fig. 4.

TURBINELLUS IMPERIALIS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXXIX. Fig. 5.

TURBINELLUS CAPITELLUM, Lamarck, Anim. sans vert., vol. vii. p. 106.
Chemnitz, Conch., vol. xi. pl. 179. f. 1723 and 1724.
Turbinella muricata, Encyclopédie Méthodique.

Pl. CCXXIX. Fig. 6 and 7.

TURBINELLUS ARMATUS, Broderip, Proceedings Zool. Soc., 1833, p. 7.

CANCELLARIA, Lamarck.

Testa ovalis, extùs costellata, aut variè reticulata, anfractu ultimo subventricoso, umbilicum amplum sæpiùs formante; columellâ valdè plicatâ, plicis modò perpaucis, modò numerosis, in canalem brevem, nonnunquam posticè recurvum, desinente; aperturâ ovatâ, vel oblongo-ovatâ, labro subexpanso, plerumque denticulato, fauce sulcatâ aut striatâ.

There are few genera of mollusks which have been so enriched by modern discovery as the present: of the seventy or eighty species with which we are now acquainted only nine were known to Lamarck, and there is scarcely one of this beautiful series that is not esteemed for its comparative rarity. The Cancellariæ were included by the early naturalists with that large and heterogeneous mass of shells which they described under the common titles of *Buccinum* and *Purpura*, whilst Linnæus, attaching an undue importance to the plaits on the columella, referred them to his genus *Voluta*. Lamarck detected their affinity with the *Turbinelli*, to which they are intimately allied, although their shells may be said to differ in many important particulars. They are never fusiform, so that

the basal canal is not developed to any length, nor are they ever armed with spines or tubercles. Some of the Cancellariæ resemble the *Nassæ* a little in their general form, but they may be always distinguished from these by the plaits on the columella.

The shell of Cancellaria may be described as being oval, and variously ribbed or reticulated on the outside, the last whorl being somewhat ventricose, and often forming a large umbilicus; the columella, which is strongly marked with a greater or less number of plaits, ends in a short, sometimes posteriorly recurved canal; and the aperture is ovate, or ovately oblong, with the lip somewhat expanded, generally denticulated, and either striated or sulcated within.

Examples.

Pl. CCXXX. Fig. 10.

CANCELLARIA INDENTATA, Sowerby, Proceedings Zool. Soc., 1832, p. 54.

Pl. CCXXX. Fig. 11.

CANCELLARIA BUCCINOIDES, Sowerby, Proceedings Zool. Soc., 1832.

Pl. CCXXX. Fig. 12.

CANCELLARIA CLAVATULA, Sowerby, Proceedings Zool. Soc., 1832.

Pl. CCXXX. Fig. 13.

CANCELLARIA UNIPLICATA, Sowerby, Proceedings Zool Soc., 1832.

Pl. CCXXX. Fig. 14.

CANCELLARIA MITRIFORMIS, Sowerby, Proceedings Zool. Soc , 1832.

Pl. CCXXX. Fig. 15.

CANCELLARIA TRITONIS, Sowerby, Conch. Illus. Cat., p. 2. no. 14.

Pl. CCXXX. Fig. 16 and 17.

CANCELLARIA GRANOSA, Sowerby, Conch. Illus. Cat., p. 2. no. 15.

12
2
11
12
14
16
15
20
17

Pl. CCXXX. Fig. 18.

CANCELLARIA LITTORINIFORMIS, Sowerby, Conch. Illus. Cat., p. 3. no. 17.

FASCIOLARIA, Lamarck.

Testa subfusiformis, interdum magnitudine perampla, spirâ acuminata, anfractuum peripheriâ sæpissimè nodulosâ; aperturâ elongatâ, labro interdum crenato, fauce nonnunquam lineatâ; columellâ lævi, crassâ, ad basem obliquè plicatâ, in canalem sublongum, rectum, desinente; plicis duabus ad quatuor, inferioribus majoribus.

The genera Fasciolaria, *Fusus*, and *Turbinellus* are very closely allied to each other: there are, indeed, many species so intermediate in their characters, that the naturalist is somewhat puzzled to determine to which genus they belong. The typical forms of these divisions are, however, well and clearly defined. The *Turbinelli*, as we have already shown, have sometimes a bucciniform, sometimes a fusiform shell, but it is always more or less distinctly characterized by the plaits running transversely across the columella. The Fasciolariæ have a long shell closely resembling that of the fusiform *Turbinelli*, but distinguished by the different disposition of the plaits; for instead of running transversely, they run obliquely down the columella, almost into the canal, and are both fewer and more lightly developed. The *Fusi* may perhaps be the most easily determined, because the columella is not plaited at all: we are, however, compelled to admit certain species into that genus which present very strong indications of plaits, as well as certain others into the genus Fasciolaria, in which the plaits are almost obsolete; whilst we find many species that may be strictly referred either to the genus Fasciolaria or *Turbinellus*, in consequence of the columellar plaits being transversely oblique, or obliquely transverse. Linnæus regarded the canal as the most important character in the Fasciolariæ, and therefore included them in the same genus with the *Murices*; he omitted, however, to notice an im-

portant difference in the growth of these shells; the *Murices* form a number of periodical varices, the Fasciolariæ do not.

The shell of Fasciolaria may be described as being somewhat fusiform, and in some instances of considerable magnitude, with the spire acuminated, and often nodulous round the periphery of the whorls; the aperture is elongated, whilst the lip is often crenated, and marked interiorly with numerous hair lines; the columella is smooth, and thick, ending in a straight canal, which is generally about the same length as the spire; the plaits are about four in number, occasionally less, and the lowest are always the largest.

Example.

Pl. CCXXXI.

FASCIOLARIA PRINCEPS, Sowerby, Tankerville Catalogue, Appendix, p. 16.
Kiener, Iconographie des Coquilles vivantes, pl. 12 and 13.
*Fasciolaria aurantiaca**, Sowerby, Genera of Shells, No. 30.

FUSUS, Bruguière.

Testa fusiformis, interdum magnitudine perampla, spirâ symmetricè acuminatâ; columellâ lævi, arcuatâ, nunquam plicatâ, in canalem rectum, plus minusve elongatum, desinente; aperturâ ovali, interdum supernè angulatâ; labro plerumque crenato, paululùm inflexo, fauce nonnunquam striatâ. Operculum corneum, infrà acuminatum.

When Bruguière entered upon his examination of the Linnæan *Murices*, he set apart all those that are fusiform and destitute of varices, under the generic title of Fusus; when, however, the Fusi of that author were distributed by Lamarck in the formation of the genera *Pleurotoma*, *Pyrula*, *Turbinellus* and *Fasciolaria*, there only remained to the genus in question

* When Mr. Sowerby published the accompanying figure of this beautiful shell for the first time in his 'Genera,' he accidentally attached to it a name that had been already used by Lamarck in reference to another species, 'Encyclopédie Méthodique,' pl. 430. f. 1. *a*, *b*.

Plate CCXXXI.

Fasciolaria aurantiaca.

Fig 1. Fusus longissimus?
2. aculeiferus
3. colossus young
4. striatus
5. Nitat

the few species that do not exhibit the labral slit of the *Pleurotomæ*, the short spire of the *Pyrulæ*, the transverse columellar plaits of the *Turbinelli*, or the oblique columellar plaits of the *Fasciolariæ*.

The shell of Fusus may therefore be described as being fusiform, sometimes of large size, with the spire symmetrically acuminated; the columella, which is smooth, arched, and never reflected, ends in a straight canal, varying considerably in length; the aperture is oval, sometimes angulated at the upper part; and the lip is generally crenated, a little inflected, and sometimes striated in the interior. The operculum is horny, and acuminated.

Examples.

Pl. CCXXXII. Fig. 1.

Fusus turricula, Kiener, Iconographie des Coquilles vivantes, pl. 5. f. 1.
Fusus longissimus? Sowerby.

Pl. CCXXXII. Fig. 2.

Fusus lanceola, Martini, Conch., vol. iv. p. 187. pl. 145. f. 1347.
Murex lancea, Wood.
Fusus aculeiformis, Sowerby (not of Lamarck).
Fusus ligula, Kiener.

Pl. CCXXXII. Fig. 3.

Fusus colosseus (testa junior), Lamarck, Anim. sans vert., vol. vii. p. 122.

Pl. CCXXXII. Fig. 4.

Fusus striatus, Sowerby, Genera of Shells, No. 39.
Pyrula striata, Gray. Griffith's Cuvier.

Pl. CCXXXII. Fig. 5.

Fusus Nifat, Lamarck, Anim. sans vert., vol. vii. p. 131. Martini, Conch., vol. iv. pl. 147. f. 1357.
Buccinum Nifat, Bruguière.

*PLEUROTOMA**, Lamarck.

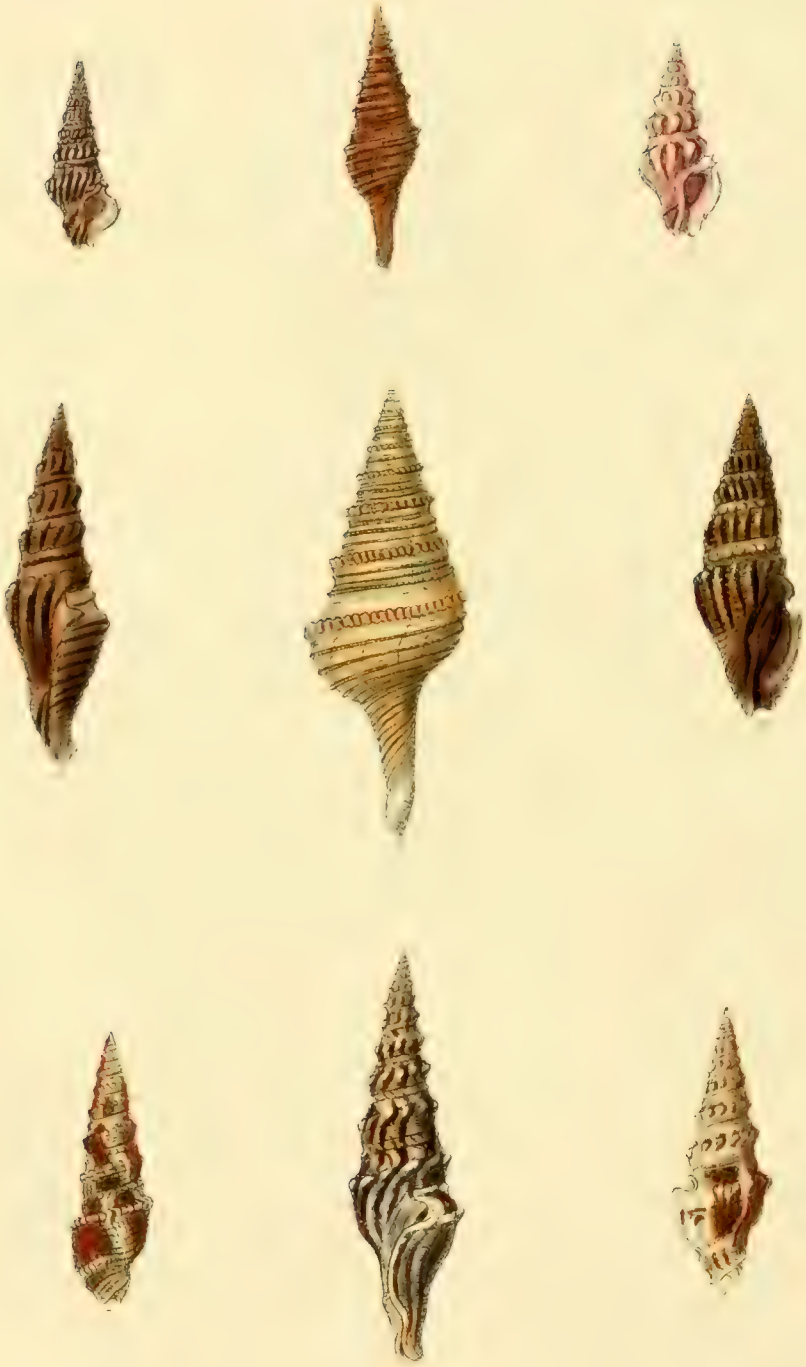
Testa turrita, fusiformis, spirâ acuminatâ; columellâ lævi, in canalem rectum, nunc elongatum, nunc breviusculum, desinente; aperturâ ovali, labro simplici, acuto, posticè vel sinu, vel fissurâ emarginato. Operculum corneum, infrà acuminatum.

The Pleurotomæ, as stated in our observations on the preceding genus, were separated by Lamarck from that portion of the Linnæan *Murices* which were set apart by Bruguière for the formation of his genus *Fusus*. He was tempted to remove these mollusks in consequence of their shell having the outer lip always more or less deeply fissured or emarginated towards the upper part, just at its junction with the last whorl; and upon observing the wide difference that exists in the length of the canal in different species, he was induced to make a further subdivision, by referring those in which the canal is comparatively short to another genus, under the title of *Clavatula*; this, however, at the suggestion of Cuvier, he very judiciously abandoned. The Pleurotomæ are numerous in species, and constitute a very beautiful and interesting genus; their shells are for the most part of an elegant fusiform shape, and may be readily distinguished by the notch or fissure in the upper part of the lip, without reference to the length of the canal. This slit is undoubtedly left by a corresponding fissure in the edge of the mantle; it may be noticed in all stages of growth, and the manner in which it is filled up as the shell advances may be generally traced throughout.

The shell of Pleurotoma may be further described as having a regularly acuminated spire, and a smooth columella, ending in a straight canal, which varies considerably in length; the aperture is oval, simple and acute, and, as we have already remarked, is always emarginated or slit at the upper part. The operculum is horny and acuminated.

* The word *Pleurotoma*, from πλευρὸν, side, and τομὴ (Dor. τομὰ), slit, is unquestionably feminine; Philippi uses it in the neuter.

Plate CCXXXIII.



Examples.

Pl. CCXXXIII. Fig. 1.

PLEUROTOMA PYRAMIDATA, Kiener, Iconographie des Coquilles vivantes, pl. 21. f. 3.

Pl. CCXXXIII. Fig. 2.

PLEUROTOMA OXYTROPIS, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIII. Fig. 3.

PLEUROTOMA ROSEA, Sowerby (not of Quoy), Proceedings Zool. Soc., 1833.

Pl. CCXXXIII. Fig. 4.

PLEUROTOMA MAURA, Sowerby (not of Valenciennes), Proceedings Zool. Soc., 1833.

Pl. CCXXXIII. Fig. 5.

PLEUROTOMA SPECIOSA*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXXXIII. Fig. 6.

PLEUROTOMA TURRICULA, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIII. Fig. 7.

PLEUROTOMA REGIA, Beck, MSS., Museum of the King of Denmark.
Clavatula rosea, Gray, MSS. British Museum (not *Pl. rosea* of Quoy).

Pl. CCXXXIII. Fig. 8.

PLEUROTOMA MACULOSA, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIII. Fig. 9.

PLEUROTOMA UNIMACULATA, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIV. Fig. 10.

PLEUROTOMA ZONULATA, *Nobis*.
Pleurotoma cincta, Sowerby (not of Lamarck), Proc. Zool. Soc., 1833.

* A figure in Griffith's Cuvier, 'Animal Kingdom,' pl. 23, with the name of *Pleurotoma carinata*, which Kiener supposes to represent a variety of *Pleurotoma nodifera*, must be intended either for this shell or the *Pleurotoma Kienerii*, Doumet, 'Mag. de Zool.'; it cannot however be cited, for it is accompanied with neither authority, reference, or description.

Pl. CCXXXIV. Fig. 11.

PLEUROTOMA BECKII, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXXXIV. Fig. 12.

PLEUROTOMA BICOLOR, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIV. Fig. 13.

PLEUROTOMA ALBICOSTATA, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIV. Fig. 14.

PLEUROTOMA DISCORS, Sowerby, Proceedings Zool. Soc., 1833.

Pl. CCXXXIV. Fig. 15.

PLEUROTOMA LINEATA, Lamarck, Anim. sans vert., vol. vii. p. 93. Encyclopédie Méthodique, pl. 440. f. 2. *a*, *b*.
Clavatula lineata, Gray.

Pl. CCXXXIV. Fig. 16.

PLEUROTOMA CRYPTORRHAPHE, Sowerby, Tankerville Cat., App., p. xiv.
Murex bicarinatus, Wood.
Pleurotoma Woodii, Kiener.

Pl. CCXXXIV. Fig. 17.

PLEUROTOMA SPIRATA, Lamarck, Anim. sans vert., vol. vii. p. 93. Encyclopédie Méthodique, pl. 440. f. 5. *a*, *b*.
Clavatula spirata, Gray.

Pl. CCXXXIV. Fig. 18 and 20.

PLEUROTOMA DIADEMA, Kiener, Iconographie des Coquilles vivantes, pl. 8. f. 2.

1. Pleurotoma nodifera.
2. ..... tigrina
3. ..... muricata.
4. ..... Stromboides
5. ..... lineata var.
6. operculum of P. Virgo.

Pl. CCXXXIV. Fig. 19.

PLEUROTOMA ECHINATA, Lamarck, Anim. sans vert., vol. vii. p. 91.
Clavatula echinata, Gray.
Murex echinatus, Wood.

Pl. CCXXXV. Fig. 1.

PLEUROTOMA NODIFERA, Lamarck, Anim. sans vert., vol. vii. p. 96.

Pl. CCXXXV. Fig. 2.

PLEUROTOMA NEGLECTA*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCXXXV. Fig. 3.

PLEUROTOMA MURICATA, Lamarck, Anim. sans vert., vol. vii. p. 91.
Pleurotoma conica, Encyclopédie Méthodique.

Pl. CCXXXV. Fig. 4.

PLEUROTOMA STROMBOIDES, Sowerby, Genera of Shells, No. 38.

Pl. CCXXXV. Fig. 5.

PLEUROTOMA OBESA, *Nobis*.
Pleurotoma lineata, var., Sowerby, Genera of Shells, No. 38.

PYRULA, Lamarck.

Testa subpyriformis, spirâ brevi, interdum retusâ; columellâ lævi, in canalem plus minusve elongatum, nonnunquam brevissimum, desinente; aperturâ oblongo-ovali, labro simplici, subacuto, fauce sæpè striatâ. Operculum corneum.

When Lamarck had disposed of so many of Bruguière's *Fusi* as were

* In a '*Monograph of the genus Pleurotoma*,' which we are now preparing for publication, we shall be enabled to show that this well-known shell, figured by Sowerby as *Pl. tigrina*, and by Kiener as *Pl. marmorata*, var., is not referable to any published species.

referable to his new genera *Turbinellus*, *Fasciolaria* and *Pleurotoma*, he found that there yet remained a certain portion whose shells are eminently distinguished by their assuming a somewhat pyriform shape through an unusual depression of the spire. These he in consequence associated under the title of Pyrula, and we recommend it to naturalists as a genus that may be profitably adopted. The *Pyrula perversa* was selected by De Montford as the type of a new genus with the title of *Fulgur*; we think, however, that that species might rather be referred to the genus now under consideration. If any further subdivision were thought advantageous, we should suggest the adoption of a genus, introduced by Swainson with the name of *Ficula*, for that portion of the Pyrulæ which are vulgarly called the "*Fig Shells.*" Another section of Pyrulæ, of which the *Pyrula papyracea* is the type, remarkable for the light papyraceous structure of their shells, and arranged on that account by Linnæus with the *Bullæ*, constitutes the genus *Rapanus* of Schumacher.

The shell of Pyrula may be described as being rather pyriform, with the spire short, and sometimes blunt; the columella is smooth, and ends in a canal, which is sometimes long, sometimes very short; the aperture is mostly of the shape of an oblong oval, and the lip is simple, and rather sharp, with the interior often striated. The operculum is horny.

Examples.

Pl. CCXXXVI. Fig. 1 and 2.

PYRULA MAWÆ*, Gray. Griffith's Cuvier, Animal Kingdom, pl. 25. f. 3 and 4.

Pl. CCXXXVI. Fig. 3.

PYRULA RAPA, Lamarck, Anim. sans vert., vol. vii. p. 144. Martini, Conch., vol. iii. pl. 68. f. 750 to 753. Encyclopédie Méthodique, pl. 434. f. 1. *a*, *b*.

Buccinum ampullaceum, Lister.

Murex rapa, Gmelin.

Rapa muricata, Knorr.

* Cabinet of the Rev. Mr. Stainforth.

Plate CCXXXVI.

G.B.S. Jun

Pl. CCXXXVI. Fig. 4.

PYRULA PAPYRACEA, Lamarck, Anim. sans vert., vol. vii. p. 144. Martini, Conch., vol. iii. pl. 68. f. 747 to 749. Encyclopédie Méthodique, pl. 436. f. 1. *a*, *b*, *c*.

Rapa alba, Seba.

Rapa amethystina, Argenville.

Bulla rapa, Linnæus.

Murex rapa, Gmelin.

Pl. CCXXXVI. Fig. 5.

PYRULA PERVERSA, Lamarck, Anim. sans vert., vol. vii. p. 158. Encyclopédie Méthodique, pl. 433. f. 4. *a*, *b*.

Murex perversus, Linnæus.

MUREX, Linnæus.

Testa ovata, vel oblonga, spirâ sæpissimè prominulâ, apice subacuto; anfractibus leviter convexis, superficie varicibus plurimis, aut ramosis, aut spinosis, plus minusve ornatâ; varice ultimo aperturæ marginem aut labrum formante, dente unico prominulo nonnunquam instructo; aperturâ suborbiculari; columellâ lævi, arcuatâ, in canalem nunc longissimum, tubulosum, nunc breviusculum, recurvum, desinente. Operculum parvum, corneum.

In the early ages of Greece, it was customary for the Κῆρυξ or common crier to introduce himself to the notice of the people by lustily blowing through a shell. We learn from tradition, as well as history, that the *Triton tuba* or Trumpet-Shell (*Murex Tritonis*, Linnæus) was the one commonly selected for that purpose; but it is more than probable that the shells of many other *Canalifera* were used. Be that as it may, it is certain that the word *Kerix* was applied by Aristotle from that circumstance to all the canaliculated shells with which he was acquainted,

and it appears to have passed, by a strange process of corruption, into that of *Murex*. We ascribe the formation of this genus to Linnæus, because the canaliferous mollusks were indiscriminately associated by the earlier naturalists under the several titles of *Murex*, *Purpura* or *Buccinum*; but it has since his time been variously and judiciously dismembered; first by Bruguière, for the introduction of his genera *Fusus* and *Cerithium*, and afterwards by Lamarck, for those which are now generally adopted.

The shells of the Murices are chiefly distinguished by their profuse and elegant display of varices; and when it is considered what an impediment the many spines and ramifications with which they are ornamented might offer to the regular volution of the whorls, it becomes both interesting and important to notice in what manner this emergency is provided for. The method is simply and beautifully contrived: the Murices, like many other mollusks, appear to have the power of slowly abrading any portion of their shell by means of some powerful solvent, and of thus removing every obstacle to its growth. The shell of the *Murex cornutus* exhibits this mode of operation distinctly: on the left of the aperture, just above the columella, may be seen the remains of a spine, which has been removed for the purpose of spreading the finishing layer of enamel. The varices are said to be formed by certain parts of the mantle, which are projected only at intervals, for the purpose of furnishing a protective margin to the shell, during a period of rest.

The following Murices have been selected by De Montford as types for the formation of new genera: the *Murex inflatus*, as having three ramified varices on each whorl, for that of *Chicoreus*; the *Murex haustellum*, as having a long closed canal, for that of *Brontes*; and the *Murex tubifer*, as having an open tubular spine between each of the varices, for that of *Typhis*. The last of these genera is certainly the most entitled to consideration; but we still think with Deshayes that it may retain all its importance as a sectional division of the primitive genus.

The shell of Murex may be described as being ovate or oblong, with the spire for the most part prominent, and rather acute at the apex; the whorls are slightly convex, and are remarkable as having the surface more

Plate CCXXXVIII.

or less divided by numerous varices, ornamented with curiously developed branches or spines, each of which forms in its turn the lip or outer margin of the aperture, and is occasionally furnished with a single prominent tooth; the aperture is nearly orbicular, and the columella, which is smooth and arched, ends in a canal, which is sometimes long, straight and tubulous, sometimes very short and recurved. The operculum is small and horny.

Examples.

Pl. CCXXXVII. Fig. 52.

MUREX RARISPINA, Lamarck, Anim. sans vert., vol. vii. p. 158. Martini, Conch., vol. iii. pl. 113. f. 1056.

Pl. CCXXXVII. Fig. 53.

MUREX FERRUGO, Wood, Index Testaceologicus, Supp., pl. 5. f. 16.
Murex anguliferus? Lamarck.

Pl. CCXXXVII. Fig. 54 and 54*.

MUREX TRIPTERUS, Born. Mus., pl. 10. f. 18 and 19. Wood, Index Testaceologicus, pl. 25. f. 15.

Pl. CCXXXVIII. Fig. 105.

MUREX MICROPHYLLUS, Lamarck, Anim. sans vert., vol. vii. p. 163. Encyclopédie Méthodique, pl. 415. f. 5.

Pl. CCXXXVIII. Fig. 106.

MUREX CLAVUS, Kiener, Iconographie des Coquilles vivantes, pl. 37. f. 2. Martini, Conch., vol. iii. pl. 111. f. 1033 to 1035.
Murex uncinarius, Sowerby (not of Lamarck).

Pl. CCXXXVIII. Fig. 107.

MUREX TRIGONULARIS, Lamarck, Anim. sans vert., vol. vii. p. 165. Sowerby, Jun., Conch. Illus. Cat., p. 4. no. 56.

Pl. CCXXXVIII. Fig. 108.

MUREX VARIUS, Sowerby, Jun., Proceedings Zool. Soc., 1840, p. 144.

Pl. CCXXXVIII. Fig. 109.

MUREX PINNIGER, Broderip, Proceedings Zool. Soc., 1832, p. 174.

Pl. CCXXXIX. Fig. 118.

MUREX ROSARIUM, Chemnitz, vol. x. pl. 161. f. 1528* and 1529. Sowerby, Jun., Conch. Illus. Cat., p. 6. no. 87.

Pl. CCXXXIX. Fig. 119.

MUREX ROTA (——— ?), Sowerby, Jun., Conch. Illus. Cat., p. 5. no. 73.

Pl. CCXXXIX. Fig. 120 and 121.

MUREX TORREFACTUS, Sowerby, Jun., Proceedings Zool. Soc., 1840, p. 141.

Pl. CCXL. Fig. 1 and 2.

MUREX CUMINGII, *Nobis.*
Typhis Cumingii, Broderip, Proceedings Zool. Soc., 1832, p. 177.

Pl. CCXL. Fig. 3 and 4.

MUREX CORONATUS, *Nobis.*
Typhis coronatus, Broderip, Proceedings Zool. Soc., 1832, p. 178.

Pl. CCXL. Fig. 5 and 6.

MUREX BELCHERI†, *Nobis.*
Typhis Belcheri, Broderip, Proceedings Zool. Soc., 1832, p. 178.
Murex Cleryi, Petit, Magazin de Zoologie, 1842.

Pl. CCXL. Fig. 7, 8 and 9.

MUREX SOVERBII, *Nobis.*
Typhis Soverbii, Broderip, Proceedings Zool. Soc., 1832, p. 178.
Testa fossilis, *Typhis fistulosus*, Brocchi?

† *Typhis Belcheri*, Broderip, found by Captain Belcher at Cape Blanco, Western Africa, and *Murex Cleryi*, Petit, dredged up by Commandant Cléry off Cape St. Thomas, coast of Brazil, are unquestionably the same species, though from very different localities.

Plate CCXL.

Pl. CCXL. Fig. 10 and 11.

MUREX PINNULIFERUS, *Nobis.*
Typhis pinnatus, Broderip, Proceedings Zool. Soc., 1832, p. 178.

RANELLA, Lamarck.

Testa ovata, vel oblonga, depressiuscula, varicibus plurimis, plus minusve obliquis, continuis, in seriem longitudinalem utroque latere dispositis; columellâ arcuatâ, rarò umbilicatâ, sæpè laminâ tenuissimâ, subrugosâ, obtectâ, in canalem brevissimum, subrecurvum, desinente; aperturâ subovatâ, labro crenulato, supernè canaliculato. Operculum corneum.

The formation of this genus is one of the more recent improvements which Lamarck effected in his subdivision of the Linnæan *Murices*. De Montford, however, is entitled to the credit of having first suggested it; he proposed to separate the Ranellæ from the *Murices* under the new generic title of *Buffo*, and he afterwards created another genus, *Apollon*, for the sake of distinguishing the few that are umbilicated. It is in the singular disposition of the varices that these mollusks exhibit their generic peculiarity; instead of being developed in frequent succession, as in the *Murices*, one varix only is deposited on the completion of every half volution; they thus become arranged in such a manner as to form a longitudinal shelf, as it were, down each side of the shell. The *Tritones*, on the other hand, only deposit a varix occasionally, and at longer intervals.

The shell of Ranella may be described as being ovate, or oblong, and rather depressed, with a number of varices, which are more or less oblique, continuous, and deposited in two longitudinal series, one on each side; the columella, which is curved, rarely umbilicated, and often overspread with a thin layer of testaceous matter, ends in a very short, somewhat recurved canal; the aperture is nearly ovate, the lip is crenulated, and at the upper part it is canaliculated.

Examples.

Pl. CCXLI. Fig. 5 and 5*.

RANELLA CRUENTATA, Sowerby, Jun., Proceedings Zool. Soc., 1841, p. 51.

Pl. CCXLI. Fig. 6.

RANELLA NANA, Sowerby, Jun., Proceedings Zool. Soc., p. 51.

Pl. CCXLI. Fig. 7.

RANELLA RUGOSA, Sowerby, Jun., Proceedings Zool. Soc., 1841, p. 51.

Pl. CCXLI. Fig. 8.

RANELLA CŒLATA, Broderip, Proceedings Zool. Soc., 1832, p. 179.

Pl. CCXLII. Fig. 16.

RANELLA VENTRICOSA, Broderip, Proceedings Zool. Soc., 1832, p. 178.

Pl. CCXLII. Fig. 17.

RANELLA ELEGANS, Beck, MSS. Sowerby, Jun., Conch. Illus. Cat., p. 8.
Murex rana? Martini, Conch., vol. iv. pl. 133. f. 1269 and 1270.

Pl. CCXLII. Fig. 18.

RANELLA SUBGRANOSA, Beck, MSS. Sowerby, Jun., Proceedings Zool. Soc., 1841, p. 52.

TRITON, De Montford.

Testa suboblonga, interdum magnitudine perampla, epidermide pilosâ nonnunquam induta; spirâ prominulâ, anfractibus varicibus modò subsolitariis, modò nullis; columellâ aut lævi, aut rugosâ, in canalem subrecurvum, vel brevem, vel longiusculum, desinente; aper-

Plate CCXLI

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1. *Triton australis*
2 *clandestinus.*
3 *Clavator*

turâ suborbiculari, labro incrassato, valdè crenato, supernè plus minusve canaliculato.

It was the same judicious policy which Lamarck exercised in the creation of new genera, that often tempted him to abandon many that had been introduced without occasion. De Montford proposed no less than four genera, *Triton*, *Aquillus*, *Lotorium* and *Persona* for the reception of those mollusks which we now associate under the first of the foregoing titles, in imitation of our great predecessor; the *Triton cutaceus* was selected as a type for the second of those genera, the *Triton lotorium* for the third, and the *Triton anus* for the fourth. The Tritones have all solid, well-developed shells, not distinguished by any regularity of form, for they present a greater diversity in that respect than almost any of the *Canalifera*, but by a peculiarity in the distribution of the varices, which are only deposited at long intervals. In some species the varices are altogether wanting, but there is always an association of character attached to the Tritones by which they may be readily identified.

The shell of Triton may be described as being somewhat oblong, in some cases of very large size, and occasionally covered with a strong hairy epidermis; the spire is prominent, with the whorls generally ornamented with a few remote varices, and the columella is either rough or smooth, ending in a rather recurved canal, which is sometimes short, sometimes rather long; the aperture is nearly orbicular, and the lip, which is thickened and crenated, is always more or less canaliculated at the upper part.

Examples.

Pl. CCXLIII. Fig. 1.

TRITON AUSTRALIS, Lamarck, Anim. sans vert., vol. vii. p. 179.
Murex tritonium australe, Chemnitz, Conch., vol. xi. pl. 194. f. 1867 and 1868.

Pl. CCXLIII. Fig. 2.

TRITON CLANDESTINUS, Lamarck, Anim. sans vert., vol. vii. p. 188. Encyclopédie Méthodique, pl. 433. f. 1.
Murex clandestinus, Chemnitz.

Pl. CCXLIII. Fig. 3.

TRITON CLAVATOR, Lamarck, Anim. sans vert., vol. vii. p. 185. Martini, Conch., vol. iii. pl. 112. f. 1048 and 1049.
Murex clavator, Chemnitz.

Pl. CCXLIV. Fig. 1.

TRITON LOTORIUM, Lamarck, Anim. sans vert., vol. vii. p. 182. Rumphius Mus., pl. 26. f. B.
Murex lotorium, Linnæus.
Triton distortum, Encyclopédie Méthodique.
Lotorium lotor, De Montford.

Pl. CCXLIV. Fig. 2.

TRITON ANUS, Lamarck, Anim. sans vert., vol. vii. p. 186. Encyclopédie Méthodique, pl. 413. f. 3. *a*, *b*.
Murex anus, Linnæus.
Persona anus, De Montford.

Pl. CCXLIV. Fig. 3.

TRITON CUTACEUS, Lamarck, Anim. sans vert., vol. vii. p. 188. Encyclopédie Méthodique, pl. 414. f. 2. *a*, *b*.
Murex cutaceus, Linnæus.
Aquillus cutaceus, De Montford.

Family 9. ALATA.

Testa canaliculata, labro, ætate mutabili, in alam plus minusve ampliato, lacunâ propè ad canalem sinuato.

The family we have now to treat of was instituted by Lamarck; it was founded for the reception of a small group of mollusks, whose shells exhibit an unusual expansion of the lip on completing their allotted growth,

1. Triton Lotorium.
2 Anus.
3 cutaceus.

and included three genera, *Strombus*, *Rostellaria* and *Pterocera*. The genus *Struthiolaria*, which Lamarck referred to his family of "*Les Canalifères*," has, however, been very properly added by Deshayes, and we think that the removal is one that cannot fail to be appreciated. De Blainville introduces a very different arrangement of these genera, and it is one which seems utterly at variance with their natural characters. The genus *Rostellaria* he assigns to his family of the *Siphonostomata*, between *Pleurotoma* and *Fusus*, and the *Struthiolariæ* are included with the *Tritones* in the same family; whilst *Strombus* is arranged, together with the genus *Conus*, in another family, the *Angyostomata*, on account of an affinity which he attributes to these genera because their shells somewhat resemble each other when young. The peculiarity just alluded to in the lip of the Alata, is that it is not expanded at different periods of growth as in the *Murices*, so as to leave a number of external varices, but only on arriving towards maturity; and it is often enlarged so as entirely to cover the spire, extending in many instances into a number of canaliculated claws or digitations. Another character, which may be accounted of importance, is the constant appearance of a sinus or indenture in the lower part of the lip near the basal canal, and some species are remarkably characterized by their having a deep canal on the upper part of the shell running from the aperture nearly to the top of the spire.

The family of the Alata includes four genera, as follows:

STRUTHIOLARIA.	PTEROCERA.
ROSTELLARIA.	STROMBUS.

STRUTHIOLARIA, Lamarck.

Testa oblongo-ovata, spirâ acuminatâ, apice subobtuso; aperturâ obliquè ovatâ; columellâ incrassatâ, politâ, in canalem brevissimum, obtusum, desinente; labro incrassato, sinuoso, sinu subindistincto, propè ad canalem instructo.

The *Murex stramineus* of Linnæus, which Lamarck selected for the formation of this genus on account of its exhibiting a very distinct association of characters, may be regarded as being intermediate between the *Tritones* and the *Rostellariæ*. We cannot, however, but consider that the Struthiolariæ are more nearly allied to the latter, although De Blainville, refusing to acknowledge the generic distinction which that author allotted to it, refers them to a place amongst the former. The founder of the genus describes them as having a shell very like that of the *Buccina*; they differ however, he says, in having a varix on the outer lip; he then goes on to remark, that the shell of Struthiolaria is the only instance of one having only a single varix, and refers the genus for this reason to his family of the *Canalifera*. Now this marginal varix (if it can be called a varix at all,) is not in any way analogous to the varices of the *Tritones* or *Murices*; it is, in fact, merely a reflection of the outer lip similar to that in the shell of many other mollusks, not formed until the shell arrives at maturity, but unusually thickened in this instance by an abundant effusion of enamel. Deshayes was the first to remove the Struthiolariæ to the family of the *Alata*, though we believe the alteration was originally suggested by Sowerby; and we fully estimate the affinity which the first of these authors traces, first with the *Rostellariæ*, in their having the columella rounded and ending in a beaked point; and then with the *Pteroceræ*, in the basal canal being almost obsolete.

The shell of Struthiolaria may be described as being of an oblong-oval form, with the spire regularly acuminated, and rather obtuse at the apex; the aperture is obliquely ovate; the columella, which is thickened and polished, ends in a very short, blunted canal; and the lip is thickened, sinuous, and furnished with a somewhat indistinct sinus near the canal.

Examples.

Pl. CCXLV. Fig. 1 and 2.

STRUTHIOLARIA STRAMINEA, Sowerby, Genera of Shells, No. 1. Chemnitz, Conch., vol. x. pl. 160. f. 1520 and 1521. Encyclopédie Méthodique, pl. 431. f. 1. *a*, *b*.

Murex stramineus, Gmelin.

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Buccinum papulosum, Martyn.
Buccinum coronarium, Solander.
Murex pes Struthiocameli, Chemnitz.
Struthiolaria nodulosa, Lamarck.

Pl. CCXLV. Fig. 3 and 4.

STRUTHIOLARIA CRENULATA *, Lamarck, Anim. sans vert. vol. vii. p. 148.
Struthiolaria inermis, Sowerby.

ROSTELLARIA, Lamarck.

Testa fusiformis, vel subturriculata, anfractibus leviter convexis, versus apicem sæpius longitudinaliter striatis; aperturâ oblongâ, in canalem elongatum productâ, interdum supra spiræ dimidium extensâ; columellâ politâ, in canalem rostratum, nonnunquam longissimum, desinente; labro subalato, margine vel dentato, vel digitato, propè ad canalem sinuato. Operculum parvum, corneum.

The Rostellariæ, which were separated by Lamarck from the Linnæan *Strombi*, have a solid shell of very peculiar growth. It is distinguished, in the first place, by the formation of the columella ending in an unusually long, or in a short beaked canal; and, in the second place, by another distinct canal running from the aperture partially up the spire. The outer lip, which is always either serrated, or digitated, exhibits clearly an indication of the claws which characterise the shell of *Pterocera*, and we cannot, therefore, admit the propriety of De Blainville placing this genus amongst the *Canalifera*, between the *Pleurotomæ* and the *Fusi*.

The digitated varieties of Rostellariæ, such as the *R. pes Pelicani*, *pes Carbonis*, *occidentalis*, &c., which have the closest affinity with the *Ptero-*

* This is undoubtedly the *Struthiolaria crenulata* of Lamarck, and it is only to be regretted that he should have referred it to the *Auris vulpina* of Chemnitz, a land mollusk of the family *Colimacea*, and consequently one of totally different habits.

ceræ, are distinguished by Gray, Sowerby and others of the present day, in imitation of Petiver, with the generic title of *Aporrhais*. The Ἀπορρᾴδες of Aristotle, however, included all mollusks whose shells exhibit a widely-expanded lip or marginal varix, whether Rostellariæ, *Strombi*, or *Murices*.

The shell of Rostellaria may be described as being fusiform, or somewhat turriculated, with the whorls slightly convex, and often longitudinally striated towards the apex; the aperture is oblong, and opens into a long canal, which is sometimes extended half-way up the spire; the columella is polished, and ends in a beaked canal varying considerably in length; the lip is somewhat winged, either dentated or digitated, and sinuated near the canal. The operculum is small and horny.

Examples.

Pl. CCXLVI. Fig. 1 and 2.

Rostellaria Povisii, Petit, Magasin de Zoologie, 1842. Sowerby, Jun., Thesaurus Conchyliorum, Part I. pl. 5. f. 5 and 6.

Pl. CCXLVI. Fig. 3.

Rostellaria occidentalis, Beck, Magasin de Zoologie, pl. 72.
Aporrhais occidentalis, Sowerby, Jun.

Pl. CCXLVI. Fig. 4.

Rostellaria rectirostris*, Lamarck, Anim. sans vert., vol. vii. p. 192. Martini, Conch., vol. iv. p. 338. Vignette 41. Sowerby, Jun., Thesaurus Conchyliorum, pl. 5. f. 8 and 10.

Purpura bilinguis, } Lister.
Buccinum bilingue, } Lister.
Buccinum rostratum, } Lister.
Murex fusus, } Linnæus.
Strombus fusus, } Linnæus.
Fusus dentatus, Martini.
Strombus clavus, Gmelin.

* Cabinet of the Rev. Mr. Stainforth.

Plate CCXLVI.

G.B.S. Junr

Pl. CCXLVI. Fig. 5.

ROSTELLARIA PES PELICANI, Lamarck, Anim. sans vert., vol. vii. p. 193. Martini, Conch., vol. iii. pl. 85. f. 848 to 850.
Cochlea pentadactylos, Pliny.
Turbo pentadactylos, Bonanni.
Strombus rostratus, Gualter.
Vespertilio spinosus, Seba.
Strombus pes Pelicani, Linnæus.
Alata pes Pelicani, Martini.
Aporrhais pes Pelicani, Sowerby, Jun.

PTEROCERA, Lamarck.

Testa subturrita, ovato-oblonga, ventricosa, anfractu ultimo valdè majore; aperturâ oblongâ; columellâ sæpè striatâ, in canalem elongatum, recurvum, desinente; labro sinu distincto, incrassato, in alam digitatam ætate ampliato, fauce plerumque striatâ. Operculum corneum, crassum, oblongum, basi acutum.

The Pteroceræ were arranged by Lister, Gualter, Aldrovand and other of the early naturalists, together with the digitated varieties of *Rostellariæ*, under the old Aristotelian title of *Aporrhais*. Linnæus confounded them with the *Strombi*; and it was not until the regular introduction of the genera we have adopted, that a clear and correct distribution of these mollusks was established. Their shells are very peculiar in their manner of growth, and differ essentially from those of any genus, excepting *Rostellaria*; when nearly completed the lip becomes very widely expanded, passing in many instances completely over the top of the spire, and the margin extends into a number of canaliculated claws or digitations. Even the columella terminates in a canaliculated claw, and there is often one or more of these claw-like developments between the canal and the labral sinus.

De Blainville still refuses to allow of the Pteroceræ being distinguished as a genus, including them after the manner of Linnæus with the *Strombi*; he is, however, the only author who has failed to appreciate this arrangement.

The shell of Pterocera may be described as being somewhat turrited, ovately-oblong, and ventricose, the last whorl being very considerably larger than the others; the aperture is oblong; the columella, which is frequently striated or lined, ends in a long recurved canal, and the lip, in which the sinus is strongly developed, is thickened and expanded into a clawed or digitated wing, increasing with age, and often striated in the interior like the columella. The operculum is horny, thick, oblong, and acute at the base.

Examples.

Pl. CCXLVII. Fig. 1.

Pterocera rugosa, Sowerby, Jun., Thesaurus Conchyliorum, Part II. pl. 11. fig. 9 and 10. Martini, Conch., vol. iii. pl. 87. f. 856 and 857.
Pterocera chiragra, var., Lamarck.
Ungula Diaboli, Martini.

Pl. CCXLVIII. Fig. 1.

Pterocera multipes, Deshayes, Règne Animal (Cuvier), Mollusques, pl. 61. f. 3. and 3, *a*. Sowerby, Jun., Thesaurus Conchyliorum, Part II. pl. 11. fig. 8.
Strombus multipes, Chemnitz, Conch., vol. x. pl. 157. f. 1494 and 1495.
Pterocera millepeda, var., Lamarck.

Pl. CCXLVIII. Fig. 2.

Pterocera crocea, *Nobis*, Sowerby, Jun., Thesaurus Conchyliorum, Part II. pl. 11. fig. 4.
Strombus novem dactylis, Chemnitz, Conch., vol. x. pl. 155. f. 1479.
Pterocera elongata, ——— ?

Pteroceras Chiragra, var.?

Plate CCXLVIII.

STROMBUS, Linnæus.

Testa turrita, ventricosa, spirâ conicâ, sæpè plicatâ; basi in canalem brevem, seu emarginatum, seu truncatum, desinente; aperturâ elongatâ, supernè canaliculatâ; columellâ lævi, plerumque incrassatâ; labro in alam simplicem plus minusve ampliato, supernè lobato, supra spiram sæpè extenso, infernè lacunâ propè ad canalem sinuato. Operculum corneum, parvum, anticè attenuatum.

We cite Linnæus as author of the genera he adopted, because the titles, and, in some instances, the divisions, instituted by earlier writers were not used with regularity. We honour this naturalist, because a degree of method was employed in his arrangement of the 'Systema Naturæ' that had not previously been attained; he reduced the entire face of nature to a state of order, and effected a mighty revolution in the study of the natural sciences by the aid of that grand binominous principle of nomenclature that has since been followed. Linnæus, therefore, is accounted to be the author of this genus, although the word Στρόμβος was used by Aristotle, Galen, Xenocrates, and many of the ancient Greek writers, in speaking of the mollusks referred to it; he distinguished his Strombi by the presence of a strong sinus in the lip near the basal canal, and except in being dismembered of the *Pteroceræ* and *Rostellariæ*, the genus remains nearly the same as he left it.

The Strombi are found chiefly in the tropical regions, and exhibit many vivid varieties of colour; the principal specific variations consist in the different expansions of the outer lip.

The shell of Strombus may be described as being turrited, and ventricose, with a conical spire, which is often plaited; and the base of the shell terminates in a short canal, which is either emarginated, or truncated; the aperture is long, and canaliculated at the upper part; the columella is smooth, and generally thickened; and the lip becomes more or less enlarged or expanded into a simple wing, which, being lobed

towards the upper part, is often extended above the spire, and more or less deeply sinuated at the lower part near the canal. The operculum is small, horny, and attenuated anteriorly.

Examples.

Pl. CCXLIX. Fig. 1.

STROMBUS THERSITES*, Gray, MSS., British Museum. Sowerby, Jun., Thesaurus Conchyliorum, Part I. pl. 10. f. 109.

Pl. CCL. Fig. 2.

STROMBUS NOVÆ ZELANDIÆ, Chemnitz, Conch., vol. x. p. 210. pl. 156. f. 1485 and 1486.

Strombus auris Dianæ, var. Novæ Zelandiæ, Solander.

Strombus Pacificus, Swainson. Sowerby, Jun.

Pl. CCL. Fig. 3.

STROMBUS PERUVIANUS, Swainson, Zoological Illustrations, pl. 10. f. 110. Sowerby, Jun., Thesaurus Conchyliorum, pl. 10. f. 110.

Pl. CCLI. Fig. 4.

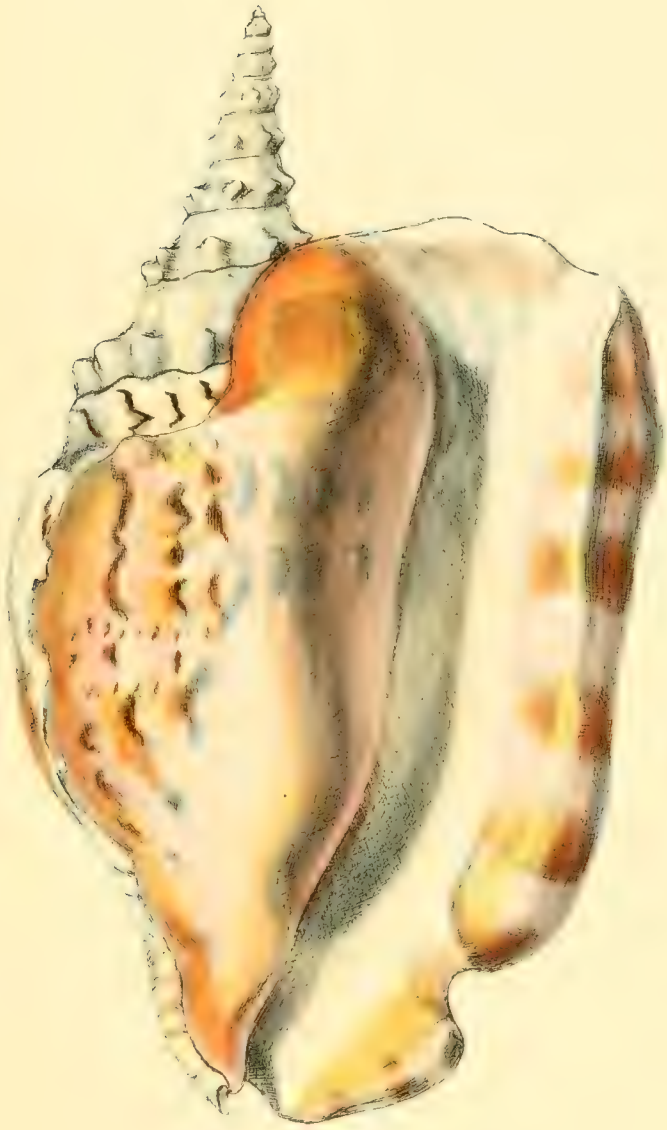
STROMBUS AURIS DIANÆ, Linnæus, Syst. Nat. (Gmelin), p. 3512. Chemnitz, Conch., vol. x. pl. 156. f. 1487 and 1488.

Pl. CCLI. Fig. 5.

STROMBUS VARIABILIS, Swainson, Zoological Illustrations. Sowerby, Jun., Thesaurus Conchyliorum, pl. 6. f. 9, 13 and 14.

* Only four specimens of this remarkable shell are known in this country, and we are not aware that it exists in any other. The best of these, represented in our plate, is in the collection of H. Cuming, Esq.; the second is in that of Miss Saul; and there are two in the British Museum.

Plate CCXLIX.



G.B.S. Junr

Plate CCL.

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4. *Strombus Auris Dianæ*
5. *variabilis var. Sw.*
6. *tridentatus*
7. *Fissurella, Linn.*
8. *[illegible]*

Pl. CCLI. Fig. 6.

STROMBUS DENTATUS, Linnæus, Syst. Nat., p. 1213. Chemnitz, Conch., vol. x. p. 157. f. 1501 to 1503.
Strombus tridentatus, Lamarck. Sowerby.
Var. *Strombus Samar*, Chemnitz.

Pl. CCLI. Fig. 7.

STROMBUS FISSURELLA? Linnæus, Syst. Nat., p. 1212. Sowerby, Genera of Shells, No. 20. Sowerby, Jun., Thesaurus Conchyliorum, pl. 8. f. 64 and 65.
Rostellaria fissurella? Lamarck.
Var. *Strombus cancellatus*? Lamarck.

Pl. CCLI. Fig. 8. (fossil.)

STROMBUS DECUSSATUS, Defrance. Sowerby, Genera of Shells, No. 20.

Family 10. PURPURIFERA.

Testa vel in canalem brevem, subascendentem, vel in sinum profundum, posticè recurvum, desinens. Operculum corneum, interdum nullum.

The family of the Purpurifera, which includes a very large portion of the Gasteropodous mollusks, agrees as nearly as possible with the well-known genus *Buccinum* of Linnæus; their shells are chiefly distinguished from those of the *Canalifera* by terminating either with a short, somewhat ascending canal, or with a posteriorly recurved sinus; and they present in some instances a considerable anomaly of appearance. The *Magilus*, for example, after forming its shell for two or three whorls in the usual manner, is obliged to pursue a nearly straight instead of a revolving growth, to prevent its becoming totally imbedded; and there are many little peculiarities in the shell of *Trichotropis* which will be duly noticed. There are few indications of any varices in the shells of this family, except in

those of the *Harpæ*, where they are remarkably numerous; a few others occasionally exhibit a rudimentary one, or more.

The greater portion of the Purpurifera are included by De Blainville in his family of the *Entomostomata*, agreeing as nearly as possible with the plan of Lamarck here followed; one genus, however, *Columbella*, has been variously arranged by authors. Lamarck placed it with the *Columellata*, as being allied to the *Mitræ*; De Blainville with the *Canalifera*, as being allied to the *Turbinellæ*; and Deshayes and Gray with the Purpurifera, as being allied to the *Ricinulæ*; we think the last of these arrangements undoubtedly the most entitled to consideration. The genera *Ancillaria* and *Oliva*, which are here referred to this family after Gray, were arranged with the *Convoluta* by Lamarck, and with the *Columellata* by Deshayes.

We include twenty genera in this family, as follows:

Cassidaria.	Trichotropis.
Oniscia.	Magilus.
Cassis.	Leptoconchus.
Ricinula.	Buccinum.
Columbella.	Nassa.
Purpura.	Planaxis.
Monoceros.	Eburna.
Concholepas.	Ancillaria.
Harpa.	Oliva
Dolium.	Terebra.

CASSIDARIA, Lamarck.

Testa ovoidea, anfractu ultimo ventricoso, ad basem attenuata, in canalem curvum, posticè ascendentem, desinens; aperturâ longitudinali, infernè angustatâ; labro columellari lævi, latissimè effuso; labro

externo reflexo, nonnunquam crenato. Operculum corneum, orbiculare.

This genus, according to priority, is entitled to the name of *Morio*, for as such it was first introduced by De Montford. Lamarck substituted that of Cassidaria, and it has been so universally followed, that custom alone sanctions the propriety of retaining it. The Cassidariæ, of which only two or three species are known, were amongst those mollusks which Bruguière separated from the Linnæan *Buccina* under the generic title of *Cassidea*, otherwise *Cassis*. De Montford then selected the *Cassidea echinophora* as a type for the formation of this genus, and it has been deservedly adopted; Lamarck, however, in enumerating the species, admitted one, the *Strombus oniscus* of Linnæus, which we cannot but think highly merits the distinction that has been assigned to it by Sowerby. It has been elevated by that author to the rank of a genus with the name of *Oniscia*; and although De Blainville, Deshayes, and Kiener all refuse to acknowledge it, its importance is generally appreciated; the *Onisciæ* are indeed more distinct from the Cassidariæ, than the Cassidariæ are from the *Cassides*. We believe the first of the above-named writers has now abandoned both of these genera; he admitted Cassidaria in his 'Manuel de Malacologie,' but has since included it under *Cassis*. The Cassidariæ are undoubtedly very closely allied to the *Cassides*, but there is a peculiarity of character attached to their shells which surely identifies them; and we ever rely upon those characteristic symbols, which, though difficult to be described, speak unerringly to the eye.

The shell of Cassidaria may be described as being of an oval shape, with the last whorl rather ventricose, and attenuated towards the base into a curved canal, turning up in a posterior direction; the aperture is longitudinal, and narrowed towards the lower part; the columellar lip is smooth, and very widely spread over the body whorl, and the outer lip is reflected, and sometimes crenated. The operculum is horny, and orbicular.

Examples.

Pl. CCLII. Fig. 1.

CASSIDARIA ECHINOPHORA, var. (notatu digna), Lamarck, Anim. sans vert., vol. vii. p. 215.

Buccinum echinophorum, Linnæus.

Cassidea echinophora, Bruguière.

Pl. CCLII. Fig. 2 and 3.

CASSIDARIA TYRRHENA*, Lamarck, Anim. sans vert., vol. vii. p. 216. Chemnitz, Conch., vol. x. pl. 153. f. 1461 and 1462. Encyclopédie Méthodique, pl. 405. f. 1. *a*, *b*. Kiener, Iconographie des Coquilles vivantes, pl. 1. f. 1.

Buccinum cassideum Tyrrhenum, Chemnitz.

Cassidea Tyrrhena, Bruguière.

Cassidaria echinophora, var., Philippi.

ONISCIA, Sowerby.

Testa oblonga, subcylindrica, spirâ brevi, apice interdum obtusiusculo, in canalem brevissimum desinens; aperturâ angustâ, longitudinali, labro columellari granuloso, latissimè expanso, labro externo incrassato, irregulariter denticulato, ad medium leviter coarctato.

* The shell represented in our plate in illustration of this species is undoubtedly the true *Cassidaria Tyrrhena* of Lamarck, agreeing as perfectly with his description, as with the figures he refers to. The shell figured in Sowerby's "Genera" under this title is but a common variety of the *Cassidaria echinophora*, another very singular variety of which, belonging to H. Cuming, Esq., we have also given in our plate (fig. 1.). There are many varieties of the *Cassidaria Tyrrhena*, and yet more of the *Cassidaria echinophora*; and it is therefore to be regretted that Philippi should have confounded them together. There is less difficulty in determining the limit of a *species* than of a *genus*, though the determination of both may be equally artificial, and equally a matter of fancy.

Plate CCLIII.

The *Strombus oniscus* of Linnæus, which Lamarck included with the *Cassidariæ*, was selected by Sowerby as a type for the formation of this genus, and we only regret that it has not been appreciated by continental writers. The Onisciæ have a much more solid and compact shell than the *Cassidariæ*, the canal is scarcely recurved, and the columellar lip is particularly characteristic in being widely spread over the body whorl, with the surface curiously granulated. Deshayes rejects this genus because we are as yet unacquainted with the animal, and therefore unable to determine the strict propriety of its introduction; but may we not infer that these granular spots or excrescences, which are very differently disposed from those which the shells of the *Cassides* sometimes exhibit, indicate a sufficient variation?

The shell of Oniscia may be described as being of an oblong or somewhat cylindrical form, ending with a short, and nearly straight canal; the spire is also rather short, and generally obtuse at the apex; the aperture is narrow, and longitudinal; the columellar lip spreads widely over the body whorl, and is profusely covered with small granular pimples; the outer lip is irregularly denticulated, and somewhat contracted towards the middle.

Examples.

Pl. CCLIII. Fig. 1.

ONISCIA STROMBIFORMIS, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLIII. Fig. 2 to 4.

ONISCIA TUBERCULOSA, Sowerby, Genera of Shells, Oniscia, p. 2.

Pl. CCLIII. Fig. 5 and 6.

ONISCIA DENNISONI*, *Nobis*, Proceedings Zool. Soc., 1842.

* This valuable shell, the vivid colour and beauty of which is not in the least exaggerated in our representation of it, is so nearly allied to the *Oniscia cancellata*, that we were disposed at first sight to question the propriety of separating it. A minute examination, however, assured us that it differs essentially in many respects; the whorls are evidently more angular, the spire more depressed, and just within the outer lip is a row of blunted tubercles;

Pl. CCLIV. Fig. 1 to 3.

ONISCIA CANCELLATA, Sowerby, Genera of Shells, No. 24.
Cassidaria cancellata, Kiener.

Pl. CCLIV. Fig. 4.

ONISCIA ONISCUS, Sowerby, Genera of Shells, No. 24. Chemnitz, Conch., vol. xi. pl. 195 A. f. 1872 and 1873.
Strombus oniscus, Linnæus.
Cassis verruculatus, Martini.
Cassidaria oniscus, Lamarck.

Pl. CCLIV. Fig. 5. (fossil.)

ONISCIA CITHARA, Sowerby, Genera of Shells, No. 24.
Buccinum cithara, Brocchi, Conchologia Fossile Subappenina, pl. 5. f. 5.

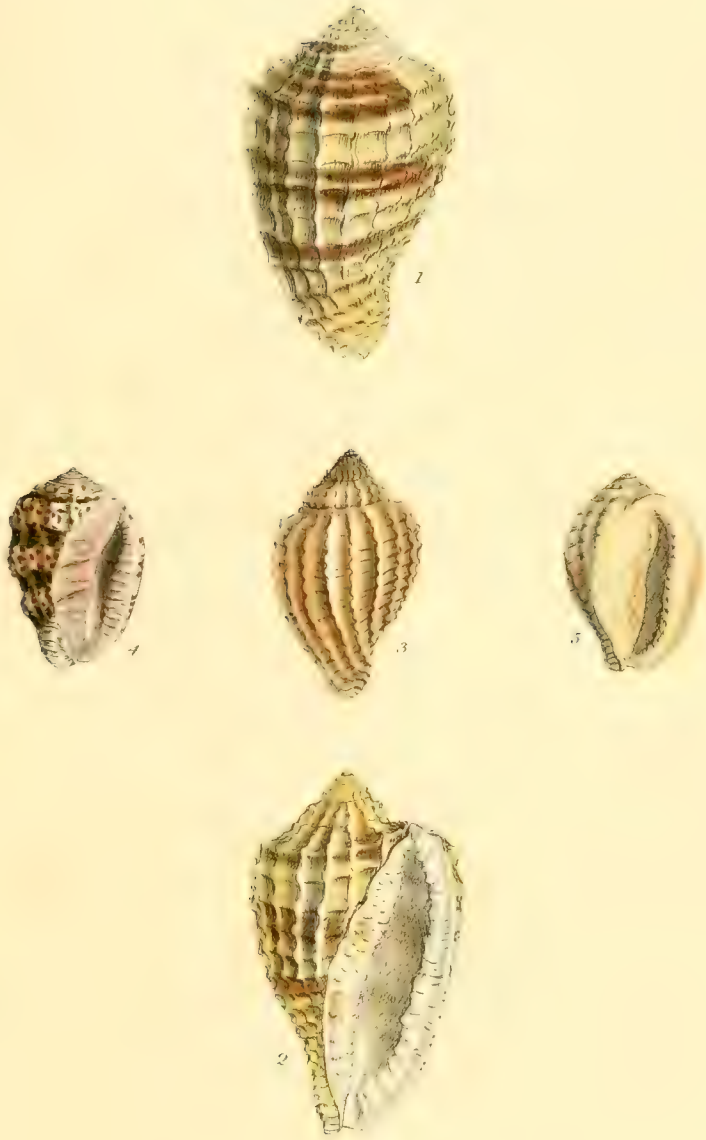
CASSIS, Klein.

Testa ovata, vel trigona, anfractu ultimo inflato, varicibus interdum remotè armata, n canalem brevem, subitò reflexum, desinens; aperturâ longitudinali; labro columellari sæpè rugoso, aut granuloso.

The shells of the Cassides appear to have been known by the common appellation of "Helmets" from the time of Bonanni; Klein was, however, the first author who associated them in the system with any degree of regularity. His arrangement was, nevertheless, disregarded by Linnæus: the extreme caution with which the operations of that great

the rich scarlet appearance of the columellar lip is moreover remarkable; and as this portion of the shell constitutes its chief generic character, may not so decided a variation of it be alone considered of sufficient specific importance? The specimen from which our drawing is taken belongs to J. Dennison, Esq., a gentleman well known in the conchological world as an assiduous collector of shells; we have been informed that there is another specimen in existence, but in very bad condition.

Plate CCLIV.



1 2 & 3 *Oniscia cancellata*
4 ..... *Oniscus*

1 Cassis glauca
2 flammea

naturalist were guided, made him excessively cautious in the admission of new genera; he referred the Cassides to his genus *Buccinum*; and indeed it cannot be wondered that the generalizations of that author should have been so circumscribed, when we consider how small an amount of material he had to work with, compared to what we command in the present day. Bruguière revived the genus Cassis of Klein, with a full exposition of the species, in the 'Encyclopédie Méthodique'; and for fear that the word Cassis might induce the unlearned to suppose that all the shells of this genus are as large and ponderous as warriors' helmets, he substituted that of *Cassidea*. Lamarck introduced the genus with its common appellative of Cassis, and, with the exceptio nof those species which he distinguished by the title of *Cassidaria*, retained it in exactly the same form as his immediate predecessor.

A genus proposed by Stutchbury with the name of *Cypræcassis*, for the sake of distinguishing the *Cassis coarctata* and those allied to it, as being intermediate in their construction between the shells of the *Cyprææ* and those of the *Cassides*, has been abandoned: so also has an arrangement, proposed by Swainson, of reserving Bruguière's title of *Cassidea* for the purpose of distinguishing the *Cassis erinacea* and its cognate species.

The shell of Cassis may be described as being ovate or triangular, and ending in a short but suddenly reflected canal, with the last whorl inflated, and sometimes remotely strengthened with varices; the aperture is longitudinal; the columellar lip is often wrinkled, or granulated, and the outer lip thickened, reflected, and more or less toothed.

Examples.

Pl. CCLV. Fig. 1.

Cassis glauca, Lamarck, Anim. sans vert., vol. vii. p. 221. Martini, Conch., vol. ii. pl. 32. f. 342 and 343.
Cassis cinerea, Klein, Rumphius, Martini, &c.
Buccinum glaucum, Linnæus.
Cassidea glauca, Bruguière.

Pl. CCLV. Fig. 2.

CASSIS FLAMMEA, Lamarck, Anim. sans vert., vol. vii. p. 220. Encyclopédie Méthodique, pl. 406. f. 3. *a*, *b*.
Buccinum flammeum, Linnæus.
Cassidea flammea, Bruguière.

RICINULA, Lamarck.

Testa suborbicularis, sæpiùs externè tuberculata, vel spinosa, spirâ brevi, interdum paululum depressâ; aperturâ longitudinali, perangustâ; columellâ subarcuatâ, vel lævi, vel dentibus prominulis, plicæformibus, instructâ, in canalem brevem, subobliquè emarginatum, desinente; labro externo sæpè digitato, dentibus plicæformibus internè instructo, aperturam plus minusve coarctantibus. Operculum corneum, tenue, semilunare.

The French authors appear to have been particularly happy in the formation of new genera; this, for example, was introduced about the same time both by De Montford and Lamarck; by the former under the title of *Sistrum*, by the latter under that of Ricinula. Much, however, as this genus is esteemed, it is not universally accepted.

Duclos followed an arrangement first proposed by Lamarck, of including the Ricinulæ with the *Purpuræ*; and although the necessity of adopting this genus has been greatly augmented during the last few years by the accession of new species, it is still abandoned by Kiener, who merely distinguishes them after the manner of Duclos, as "*Les Pourpres ricinules*," an eleventh section of his genus *Purpura*. The Ricinulæ are closely allied to the *Purpuræ*, no doubt; indeed De Blainville, when examining their anatomy, was unable to discover any great modification of character; their shells, however, present a great peculiarity of structure, and are distinguished from those of the proximate genera as much by their form

Plate CCLVI.

1. *Ricinula horrida.*
2. ..... *Morus.*
3. & 4. ..... *digitata*
5. ..... *arachnoïdes.*

and external developments, as by the plait-like teeth, which Lamarck not unaptly terms false plaits.

The shell of Ricinula may be described as being somewhat orbicular in form, and armed for the most part with sharp tubercles or spines, the spire being short, and sometimes a little depressed; the aperture is longitudinal, and very narrow in the adult shell, in consequence of the columella, which is smooth, arched, and terminated in an obliquely emarginated canal, being furnished, like the outer lip, with a number of small plait-like teeth. The operculum is horny, thin, and semilunar.

Examples.

Pl. CCLVI. Fig. 1.

RICINULA HORRIDA, Lamarck, Anim. sans vert., vol. vii. p. 231. Encyclopédie Méthodique, pl. 395. f. 1. *a*, *b*.
Murex neritoideus, Gmelin.
Purpura horrida, Duclos. Kiener.

Pl. CCLVI. Fig. 2.

RICINULA MORUS, Lamarck, Anim. sans vert., vol. vii. p. 232. Encyclopédie Méthodique, pl. 395. f. 6. *a*, *b*.
Purpura morus, Duclos. Kiener.

Pl. CCLVI. Fig. 3 and 4.

RICINULA DIGITATA, var., Lamarck, Anim. sans vert., vol. vii. p. 232. Encyclopédie Méthodique, pl. 395. f. 7. *a*, *b*.
Ricinula lobata, De Blainville.
Purpura lobata, Kiener.

Pl. CCLVI. Fig. 5.

RICINULA ARACHNOIDES (testa junior), Lamarck, Anim. sans vert., vol. vii. p. 232. Encyclopédie Méthodique, pl. 395. f. 3. *a*, *b*.
Purpura arachnoides, Duclos. Kiener.

COLUMBELLA, Lamarck.

Testa parva, ovato-oblonga, vel trigona, interdum subfusiformis, ad basem emarginata; aperturâ coarctatâ, angustâ; columellâ arcuatâ, denticulatâ, rarò lævi; labro externo incrassato, medianè tumido aut gibboso, sæpissimè denticulato. Operculum minutissimum, corneum.

This genus is one which Lamarck proposed in the plenitude of his enthusiasm, without sufficiently considering the nature of the characters upon which he founded it. The columellar denticulations which characterize the shells of the Columbellæ were incautiously regarded by that naturalist as plaits, as if they were analogous to, or rather a modification of, the plaits of the *Mitræ* or *Volutæ*; the difference first noted by De Férussac may, however, be easily detected on examination. In the *Mitræ*, &c., the plaits are strongly developed in all stages of growth, winding round the entire pillar of the shell through every whorl; the plait-like denticulations of the Columbellæ, on the contrary, are not formed until the shell arrives at maturity; they are exhibited, therefore, only in adult specimens, and are precisely analogous to the plait-like denticulations of the *Ricinulæ*. This will readily account for our arranging this genus with the Purpurifera in imitation of De Férussac, Gray, and Quoy, instead of with the *Columellata* in conformity with Lamarck; it may be also proper to notice, that the few of Lamarck's Columbellæ, which are actually plaited, belong properly to the genus *Mitra*.

The shell of Columbella may be described as being small, ovately-oblong, or triangular, occasionally somewhat fusiform, and always emarginated at the base; the aperture is contracted, and narrow; the columella is curved, and denticulated, though sometimes, but rarely, smooth; the outer lip is thickened, always swollen or gibbous towards the middle, and generally denticulated. The operculum is horny and very small.

Plate CCLVII.

Examples.

Pl. CCLVII. Fig. 1.

COLUMBELLA LYRATA, Sowerby, Proceedings Zool. Soc., 1832, p. 114. Duclos, Monographie du genre Colombelle, pl. 10. f. 13 and 14. Kiener, Iconographie des Coquilles vivantes, pl. 10. f. 1.

Pl. CCLVII. Fig. 2.

COLUMBELLA PULCHERRIMA*, Sowerby, Proceedings Zool. Soc., 1832, p. 113.

Pl. CCLVII. Fig. 3.

COLUMBELLA HARPÆFORMIS†, Sowerby, Proceedings Zool. Soc., 1832, p. 113.

Columbella citharula, Duclos, Monographie du genre Colombelle, pl. 10. f. 9 and 10. Kiener, Iconographie des Coquilles vivantes, pl. 16. f. 2.

Pl. CCLVII. Fig. 4.

COLUMBELLA HÆMASTOMA, Sowerby, Proceedings Zool. Soc., 1832, p. 116. Duclos, Monographie du genre Colombelle, pl. 5. f. 3 and 4. Kiener, Iconographie des Coquilles vivantes, pl. 10. f. 2.

Pl. CCLVII. Fig. 5.

COLUMBELLA ELEGANS, Sowerby, Proceedings Zool. Soc., 1832, p. 114. Duclos, Monographie du genre Colombelle, pl. 12. f. 9 and 10. Kiener, Iconographie des Coquilles vivantes, pl. 12. f. 2.

Pl. CCLVII. Fig. 6.

COLUMBELLA SEMIPUNCTATA, Lamarck, Anim. sans vert., vol. vii. p. 294. Duclos, Monographie du genre Colombelle, pl. 4. f. 13 and 14. Kiener, Iconographie des Coquilles vivantes, pl. 8. f. 1.

* Cabinet of H. Cuming, Esq.

† Our representation of this shell displays it in its natural and proper size; the figure given of it by Duclos, and copied by Kiener, is most absurdly magnified.

Pl. CCLVII. Fig. 7.

COLUMBELLA DORSATA, Sowerby, Proceedings Zool. Soc., 1832, p. 120.

Pl. CCLVII. Fig. 8.

COLUMBELLA RECURVA, Sowerby, Proceedings Zool. Soc., 1832, p. 115.
Columbella lanceolata, var., Duclos, Monographie du genre Colombelle. pl. 12. f. 13 and 14.

Pl. CCLVII. Fig. 9.

COLUMBELLA PHILIPPINARUM, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLVIII. Fig. 1.

COLUMBELLA STROMBIFORMIS, Lamarck, Anim. sans vert., vol. vii. p. 293. Duclos, Monographie du genre Colombelle, pl. 5. f. 7 and 8. Kiener, Iconographie des Coquilles vivantes, pl. 1. f. 1.

Pl. CCLVIII. Fig. 2.

COLUMBELLA LABIOSA, Sowerby, Genera of Shells, No. 9. Duclos, Monographie du genre Colombelle, pl. 6. f. 15 and 16. Kiener, Iconographie des Coquilles vivantes, pl. 3. f. 1.

Pl. CCLVIII. Fig. 3.

COLUMBELLA RUSTICA, Lamarck, Anim. sans vert., vol. vii. p. 293. Kiener, Iconographie des Coquilles vivantes, pl. 1. f. 3.
Voluta rustica, Linnæus.

Pl. CCLVIII. Fig. 4.

COLUMBELLA MENDICARIA, Lamarck, Anim. sans vert., vol. vii. p. 296. Kiener, Iconographie des Coquilles vivantes, pl. 6. f. 1.
Voluta mendicaria, Linnæus.

Pl. CCLVIII. Fig. 5.

COLUMBELLA PUNCTATA (?), Lamarck, Anim. sans vert., vol. vii. p. 297.

Columbella.

1. *C. strombiformis.* 5. *C. punctata*
2. ..... *labiosa.* 6. ..... *Terpsichore*
3. ..... *rustica.* 7. ..... *nitidula*
4. ..... *mendicaria.* 8. ..... *concinna*
9. *C. mercatoria var. scalata*

Martini, Conch., vol. ii. pl. 44. f. 471. Duclos, Monographie du genre Colombelle, pl. 2. f. 7 and 8.

Buccinum punctatum, Bruguière.

Pl. CCLVIII. Fig. 6.

COLUMBELLA TERPSICHORE, Sowerby, Genera of Shells, No. 9. Kiener, Iconographie des Coquilles vivantes, pl. 12. f. 1. Duclos, Monographie du genre Colombelle, pl. 10. f. 11 and 12.

Pl. CCLVIII. Fig. 7.

COLUMBELLA NITIDA, Lamarck, Anim. sans vert., vol. vii. p. 295. Duclos, Monographie du genre Colombelle, pl. 2. f. 3 and 4. Kiener, Iconographie des Coquilles vivantes, pl. 15. f. 1.

Pl. CCLVIII. Fig. 8.

COLUMBELLA CONCINNA, Sowerby, Genera of Shells, No. 9.

Pl. CCLVIII. Fig. 9.

COLUMBELLA MERCATORIA (monstrosity), Lamarck, Anim. sans vert., vol. vii. p. 294.

PURPURA, Lamarck.

Testa ovata, vel oblongo-ovata, extùs sæpissimè tuberculifera, aut spinosa, spirâ brevi, anfractu ultimo ventricoso, interdum latè inflato; aperturâ ovatâ, dilatatâ, supernè angulatâ, infernè sinu subobliquo leviter canaliculatâ; columellâ depresso-planâ in mucronem desinente; labro sæpè dentato, fauce nonnunquam crenatâ. Operculum corneum aperturam aptans.

The word Πορφύρα, Purpura, was appropriated by the early Greek writers to all mollusks that have the property of secreting a purple juice.

They became objects of especial notice in that age on account of the very limited sources then known of obtaining the purple colour, and were esteemed as objects of utility rather than of physiological interest. The property of exuding this liquor is not at all subservient as a character to the purposes of classification; it is common alike to the *Murices*, *Ianthinæ*, *Scalariæ*, and many others of the most anomalous organization. The term Purpura was, perhaps, applied more especially to the *Murices*; it seems, however, to have been abandoned, until Lamarck selected it for the sake of distinguishing those mollusks which come under our present consideration; a group whose shells are well characterized by the flatness of the columella. They are excessively numerous in species, notwithstanding the separate arrangement of the *Ricinulæ*, *Monoceri*, and *Concholepas*. Lamarck originally included these three genera with the Purpuræ, and we only regret that both Duclos and Kiener should have returned to the early plan of arrangement.

The shell of Purpura may be described as being of an oval or oblong-oval form, with the outside generally armed with spines or tubercles, the spire being short, and the last whorl ventricose, or widely inflated; the aperture is ovate, and dilated, angulated at the upper part, and slightly canaliculated with an oblique sinus at the lower; the columella is flat, and depressed, ending in a point, and the lip is often dentated. The operculum is horny, and fits closely to the aperture.

Examples.

Pl. CCLIX. Fig. 1.

PURPURA PATULA, Lamarck, Anim. sans vert., vol. vii. p. 236. Kiener, Iconographie des Coquilles vivantes, pl. 24.

Perdicea nodosa, Petiver.

Cymbium tuberosum patulum, Martini.

Buccinum patulum, Linnæus.

Pl. CCLIX. Fig. 2.

PURPURA SUCCINCTA, Lamarck, Anim. sans vert., vol. vii. p. 236. Kiener, Iconographie des Coquilles vivantes, pl. 27. f. 23.

Plate CCLIX.

1. *Purpura Patula*
Orbita
Francolinus var
Melo Duclos

Plate CCLX.

6 *Purpura Planospirata.*
7 ..... *Fucus*
8 *neritoidea*
9 *Purpura callosa*
10 *tessellata*
1 *armigera var.*
Purpura Madreporarum

Buccinum succinctum, Martyn.
Buccinum orbita, Chemnitz.
Purpura orbita, Sowerby.

Pl. CCLIX. Fig. 3.

PURPURA FRANCOLINUS, Lamarck, Anim. sans vert., vol. vii. p. 243. Seba, Mus., pl. 53. f. T.
Purpura sertum, var.?

Pl. CCLIX. Fig. 4.

PURPURA ECHINULATA, Lamarck, Anim. sans vert., vol. vii. p. 247.

Pl. CCLIX. Fig. 5.

PURPURA MELO, Duclos, Annales des Sciences Naturelles, vol. xxvi. pl. 1. f. 2. Kiener, Iconographie des Coquilles vivantes, pl. 39. f. 93.
Purpura crassa, De Blainville, Nouvelles Ann. du Mus., pl. 12. f. 4.

Pl. CCLX. Fig. 6.

PURPURA PLANOSPIRATA, Lamarck, Anim. sans vert., vol. vii. p. 240. Kiener, Iconographie des Coquilles vivantes, pl. 21. f. 61.
Purpura lineata, Encyclopédie Méthodique.

Pl. CCLX. Fig. 7.

PURPURA FUCUS, Sowerby, Genera of Shells, No. 42.
Murex fucus, Gmelin.
Purpura neritoides, Lamarck.

Pl. CCLX. Fig. 8.

PURPURA NERITOIDEA, Sowerby, Genera of Shells, No. 42.
Murex plicatus? Martini, Conch., vol. iii. pl. 100. f. 954 and 955.
Murex neritoideus, Chemnitz, Conch., vol. x. pl. 165. f. 1577 and 1578.
Fusus neritoideus, Encyclopédie Méthodique, pl. 435. f. 2. *a*, *b*.
Pyrula neritoidea, Lamarck.
Purpura violacea, Kiener.

Pl. CCLX. Fig. 9.

(A species of *Turbinellus* inserted inadvertently.)

Pl. CCLX. Fig. 10.

PURPURA TESSELLATA, Sowerby, Genera of Shells, No. 42.

Pl. CCLX. Fig. 11.

PURPURA ARMIGERA, Lamarck, Anim. sans vert., vol. vii. p. 257. Chemnitz, Conch., vol. 11. pl. 187. f. 1798 and 1799.

Buccinum armigerum, Chemnitz.

Pl. CCLX. Fig. 12.

PURPURA MADREPORARUM, Sowerby, Genera of Shells, No. 42.

Purpura monodonta, Quoy and Gaimard, Voyage de l'Astrolabe, Mollusques, pl. 37. f. 9 to 11. Kiener, Iconographie des Coquilles vivantes, pl. 17. f. 50.

MONOCEROS, Lamarck.

Testa ovata, spirâ interdum subelatâ, interdum depressâ, anfractu ultimo inflato, infernè emarginato, in canalem brevissimum subproducto; columellâ amplâ, depresso-planâ, plicis parvis interdum sed rarò instructâ; aperturâ subsemilunari; labro plerumque crenato, processu dentiformi, acutissimo, elongato, ad inferiorem partem recurvo, semper armato. Operculum corneum.

The genus Monoceros was founded by Lamarck for the reception of certain of his *Purpuræ*, whose shells are characterized by their having a sharp, strongly-developed tooth protruding from the lower part of the external lip; and it was simultaneously introduced by De Montford under the title of *Unicornus*. If it were not that this dentiform process

Plate CCLXI.

1. *Monoceros imbricatum*
2. ..... *breve, nobis*
3. ..... *lugubre, nob*
4. ..... *cingulatum*

in the shells under consideration is developed in a very remarkable degree, we should have hesitated to receive it as a generic character, for a tooth of somewhat analogous construction may be indistinctly traced in the shells of some of the *Turbinelli*, *Murices*, and other canaliferous mollusks. But in none of these instances does it assume the importance and particular character which it exhibits in the shells of the Monoceri, and we therefore feel less hesitation in adopting a genus, which Kiener and others have very recently abandoned. The Monoceri are referred by these authors to the genus *Purpura*, as a section, under the title of "*Les Pourpres Licornes*;" but in this arrangement they are compelled to remove the *Monoceros cingulatum* to the genus *Turbinellus*, on account of the columella in that species being slightly plaited.

The shell of Monoceros may be described as being ovate, with the spire sometimes a little elevated, sometimes a little depressed; the last whorl, which is generally much inflated, is emarginated at the base, and somewhat inclined into a very short canal; the columella is wide, and flattish as in the *Purpuræ*, and it is sometimes though very rarely plaited, the plaits being very small; the aperture is nearly semilunar; and the lip, which is generally crenated, is always armed at the lower part with a very sharp, long, recurved tooth. The operculum is horny.

Examples.

Pl. CCLXI. Fig. 1.

Monoceros imbricatum, Lamarck, Anim. sans vert., vol. vii. p. 251. Encyclopédie Méthodique, pl. 396. f. 3. *a*, *b*. Chemnitz, Conch., vol. x. pl. 154. f. 1469 and 1470.

Buccinum calcar, Martyn.

Buccinum monoceros, Chemnitz. Bruguière.

Buccinum monodon, Gmelin.

Purpura imbricata, Kiener.

Pl. CCLXI. Fig. 2.

Monoceros breve, Sowerby, Genera of Shells, No. 5.

Monoceros imbricatum, var.?

Pl. CCLXI. Fig. 3.

MONOCEROS LUGUBRE, Sowerby, Genera of Shells, No. 5.
Purpura lugubris, Kiener.

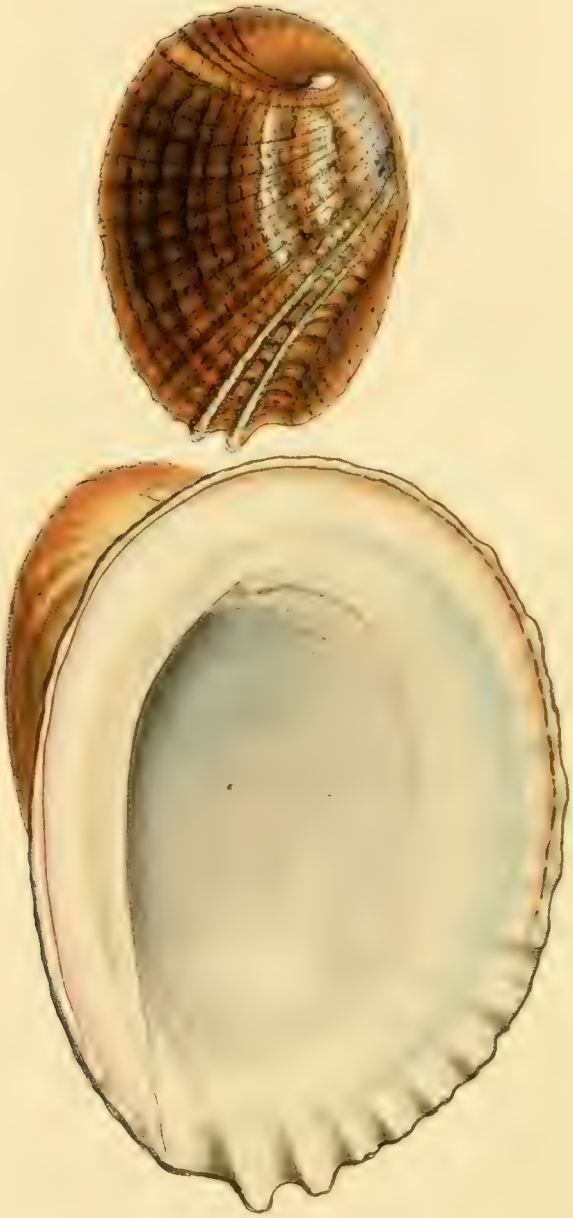
Pl. CCLXI. Fig. 4.

MONOCEROS CINGULATUM, Lamarck, Anim. sans vert., vol. vii. p. 250. Encyclopédie Méthodique, pl. 396. f. 4. *a*, *b*.
Turbinella cingulata, Kiener.

CONCHOLEPAS, Lamarck.

Testa ovata, spirâ parvâ, brevissimâ, anfractu ultimo latissimè inflato, ad basem leviter canaliculato; aperturâ amplissimâ, testæ magnitudinem æquante; labro columellari, planulato, reflexo; labro externo continuo, processibus dentiformibus tribus obtusis ad inferiorem partem armato. Operculum corneum.

One of the earliest plans of subdivision that presented itself to naturalists was that of simply separating the spiral shells from those in which there is no spire. The former, by far the more numerous, were classed under the common title of *Cochlea* or Conchs; the latter, including the *Patellæ* and such like, under that of *Lepas* or Rock Shells. Upon the discovery of the shell we have now to treat of, however, our forefathers were somewhat puzzled, for it scarcely exhibits a spire, though a spiral shell, being of a complete patelliform construction, with nevertheless a spire, not larger certainly, says Bruguière, than a grain of corn. D'Argenville in this dilemma called it, after the fashion of his day, "*Le grand Concho-Lepas*," and that expressive compound has been used either as a specific or generic name ever since. Linnæus regarded this shell, in the absence of its animal inhabitant, as a species of *Patella*, but upon the arrival of some living specimens from Peru, it was unexpectedly found to be pectinibranchiate, and operculated. Bruguière then removed it to



Concholepas Peruviana.

the *Buccina*, and Lamarck subsequently established the genus we have here adopted; it is, however, now referred by Duclos and Kiener to a place amongst the *Purpuræ*. The Concholepas unquestionably exhibits many good distinguishing characters, and it is remarkable that only one species has been discovered.

The shell of Concholepas may be described as being ovate, with only a very small, short spire; the last whorl is slightly canaliculated at the base, and very widely inflated, the aperture being extraordinarily large, equal indeed to the size of the entire shell; the columellar lip is flat and reflected, and the outer lip, which is continuous with it, is armed with three blunt, dentiform processes at the lower part, analogous in some measure to the labral tooth of the *Monoceri*. The operculum is horny.

Example.

Pl. CCLXII.

CONCHOLEPAS PERUVIANA, Lamarck, Anim. sans vert., vol. vii. p. 253. Chemnitz, Conch., vol. x. p. 320. Vignette 25. f. A B.
Le Grand Concho-Lepas, Argenville.
Concho-Patella, Chemnitz.
Patella lepas, Gmelin.
Buccinum concholepas, Bruguière.
Purpura concholepas, Kiener.

HARPA, Lamarck.

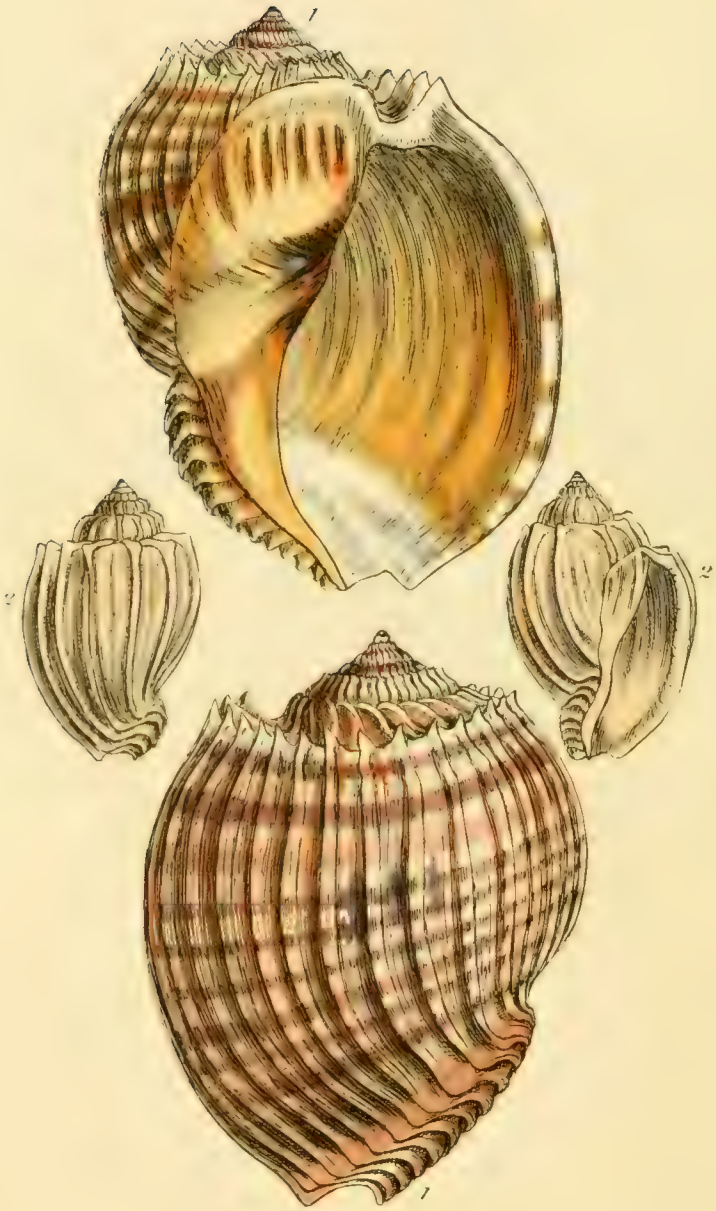
Testa ovalis, ventricosa, ad basem emarginata; spirâ brevi, apice elato, acuto; anfractibus plus minusve longitudinaliter costatis; costis parallelis, politis, mucrone acutissimo sæpè supernè armatis; aperturâ oblongâ, amplâ; columella subexpansa, lævissima, nitidâ; labro externo incrassato, costam ultimam formante. Operculum nullum.

The genus Harpa, which includes the most elegant of the long series

of *Purpurifera*, was proposed by Lamarck with the view of associating a small but characteristic group of mollusks, that had been admitted for the most part under the common title of *Buccinum costatum* or *harpa*. They approximate to the *Buccina* and the *Purpuræ*, but as their shells exhibit an accurate peculiarity and distinction, the genus has been sanctioned by subsequent naturalists. Even before the present form of classification was introduced, the different species were often called by the names of "the David's Harp," "the imperial Harp," "the rose Harp," and so forth; the determination of the species is indeed still a matter of controversy, and we find it difficult at present to give an opinion. Before we attempt to dispute with Deshayes the propriety of considering the *Harpæ ventricosa*, *imperialis*, *articularis*, *striata* and *conoidalis* as mere varieties of one and the same species, we must think well of, and consider for ourselves the momentous question,—what constitutes a species? The anatomy of the Harpæ, described first by a M. Reynaud, and afterwards by Quoy and Gaimard, has been so fully set forth by Kiener, that it is only necessary for us to notice a remarkable peculiarity in the foot of these mollusks, described by the enterprizing malacologists of the Astrolabe. It is represented as being so large and muscular as to be quite incapable of being contained within the shell, and the animal is said to have the power, when irritated or in any dangerous emergency, of spontaneously divesting itself of so much of this muscular disc as it is unable to protect within the shell. This fact at once accounts for the absence of an operculum, and only shows how little importance can be attached to that organ for the purposes of classification.

The ridges which adorn the shells of the Harpæ are evidently analogous to the varices of those of the *Canalifera*, each forms in its turn the margin of the aperture, and, like them, may probably be deposited to protect the edge of the shell during a period of rest, the greater multiplicity of ribs indicating the more periodical growth of the shell.

The shell of Harpa may be described as being oval, ventricose, and emarginated at the base, whilst the spire is short, with the apex rather elevated and acute; the whorls are more or less longitudinally ribbed, and the ribs, which run exactly parallel with one another, are highly



1 *Harpa multicostata*
2 . . . . . *mutica*

polished, and often armed at the top with a very sharp point; the aperture is oblong, and rather large; the columella is somewhat expanded, very smooth and shining, and the outer lip is thickened as forming the last rib. There is no operculum.

Examples.

Pl. CCLXIII. Fig. 1.

HARPA IMPERIALIS, Chemnitz, Conch., vol. x. p. 184. pl. 152. f. 1452. Lamarck, Anim. sans vert., vol. vii. p. 254.
Buccinum costatum, Linnæus.
Dolium Lyra Davidis, Martini.
Buccinum harpa, var., Bruguière.
Harpa multicostata, Sowerby.
Harpa ventricosa, var. α. Deshayes. Kiener.

Pl. CCLXIII. Fig. 2. (fossil.)

HARPA MUTICA, Annales du Muséum, vol. ii. p. 167. and vol. vi. pl. 44. f. 14. Anim. sans vert., vol. vii. p. 257.

DOLIUM, Lamarck.

Testa tenuis, rotundo-ovalis, ventricosissima, canali brevissimo, posticè recurvo, ad basem terminata; spirâ brevi, anfractibus sæpissimè transversim costatis, ultimo umbilicum interdum formante; aperturâ amplâ; labro columellari tenuissimo, subexpanso; labro externo plerumque vel fimbriato, vel crenato. Operculum nullum.

The Dolia were distinguished by D'Argenville and most of the early naturalists by the common appellation of "*Tuns*;" Linnæus, however, systematically referred them to a place amongst his *Buccina*. Bruguière followed the arrangement of Linnæus; but Lamarck associated them under their old appellative as a new and distinct genus, in conformity with the advancement of classification. An attempt was then made by De Mont-

ford to separate such as have their shells umbilicated under the new title of *Perdrix* (Latinè *Perdix*); this, however, failed on account of the great variableness and insignificance of that character; the presence or absence of an umbilicus depending either upon slight variation in the volution of the whorls, or upon the direction of the last effusion of enamel from the chance of its filling it up. Another and more meritorious endeavour to reduce the genus Dolium is one lately proposed by Valenciennes, in which he separates, under the new title of *Malea*, all these species which may be considered intermediate in their characters between the *Dolia* and the *Cassides* (*Dolium pomum*, *Dolium latilabre**, e. g.) on account of the lip of their shell being thickened.

The anatomy of the Dolia has been described and figured for the first time by Quoy and Gaimard in the 'Zoologie' of the 'Voyage de l'Astrolabe.'

The shell of Dolium may be described as being thin, rotundately oval, and very ventricose or inflated, terminating at the base with a very short, posteriorly reflected canal; the spire is short, and the whorls are generally ribbed transversely (transversely as regards the shell, but longitudinally as regards the whorl), the last whorl forming an umbilicus occasionally, or at different periods of growth; the aperture is large, the columellar lip thin, and somewhat widely expanded, and the outer lip for the most part either fimbriated or crenated. The Dolia, like the *Harpæ*, are not provided with any operculum.

Examples.

Pl. CCLXIV. Fig. 1.

Dolium olearium, Lamarck, Anim. sans vert., vol. vii. p. 259. Kiener, Iconographie des Coquilles vivantes, pl. 1. f. 1.

* In proof of our better estimation of the genus *Malea* of Valenciennes, it is only necessary to show the confusion that has attended this species. Though a species comparatively new, it has been yet referred to no less than four different genera by living authors, viz. *Cassis ringens*, Gray, *Buccinum ringens*, Wood, *Malea latilabris*, Valenciennes, and *Dolium latilabre*, Kiener. For our own part, we prefer Mr. Gray's arrangement, and we believe that the *Maleæ* of Valenciennes are generally referred to the genus *Cassis*.

1. *Dolium olearium.*
2. *fimbriatum.*

Buccinum olearium, Linnæus.
Dolium cepa, Martini.

Pl. CCLXIV. Fig. 2.

DOLIUM FIMBRIATUM, Sowerby, Genera of Shells, No. 29.

TRICHOTROPIS, Broderip and Sowerby.

Testa tenuis, turbinata, epidermide corneâ induta, spirâ elatâ, anfractibus sæpissimè carinatis; epidermide super carinas setosâ, setis regularibus, erectis; anfractu ultimo, ad basem leviter canaliculato, umbilicum plus minusve amplum formante; aperturâ subtrigono-ovatâ, spiræ longitudinem, nisi superante, æquante; columellâ arcuatâ, in mucronem, subobliquè truncatum, desinente; labro tenuissimo, acuto. Operculum parvum, corneum, nucleo laterali, lamellis ellipticis confertum.

The remarkable shell which has received the above generic title at the hands of Broderip and Sowerby, was originally described by the latter as a new species of Turbo in his 'Appendix to the Tankerville Catalogue.' Upon the subsequent arrival of a specimen with its animal inhabitant *, it was thought to be in great measure allied to the *Buccina*; we cannot think, however, that the anatomy of this rare mollusk has been as yet sufficiently understood to determine its true affinities. After making a careful examination of the shell as regards its texture, composition, &c., we are much inclined to think that it does not exactly belong to this part of the system, and we place it provisionally with the *Purpurifera*, purely

* The specimen here mentioned was brought from Icy Cape by Captain Belcher, R.N., who has just returned from another rambling voyage of more than ten years in the most remote quarters of the globe. "His argosy is richly come to harbour," and we only hope that the scientific world will (under favour of the Admiralty) receive the full benefit of his very meritorious exertions.

because we know little more of it than our predecessors. We believe that two or three Trichotropides have been discovered, and it now remains for Professor Owen, or some other learned anatomist, to determine their true physiological character.

The shell of Trichotropis may be described as being thin, turbinated, and covered with a thick, horny epidermis; the spire is somewhat raised, and the whorls are generally more or less carinated, the epidermis on the carinæ forming a row of fine bristles, which extend throughout, and are mostly regular and erect; the last whorl is slightly canaliculated at the base, and forms in all instances a rather large umbilicus; the aperture is triangularly ovate, and the length of it is equal to, if not exceeding, that of the spire; the columella, which is arched, ends in a somewhat obliquely-truncated point, and the lip is very thin and acute. The operculum, which has a lateral nucleus, is composed of a close series of elliptical laminæ.

Examples.

Pl. CCLXV. Fig. 1 and 2.

TRICHOTROPIS BICARINATA, Broderip and Sowerby, Zoological Journal, vol. iv. p. 374. pl. 11. f. 4 to 8.
Trichotropis Soverbiensis (?), Lesson.

Pl. CCLXV. Fig. 3.

TRICHOTROPIS UNICARINATA, Sowerby, Genera of Shells, No. 42.

MAGILUS, De Montford.

Testa alba, solidissima, in spiram ovatam convoluta, anfractibus tribus aut quatuor, ultimo in tubum plus minusve elongatum, vel flexuosum, vel undato-rectum porrecto; tubo in carinam infrà producto, superficie rugosâ, lamellatâ. Operculum corneum, ellipticum, in striis subconcentricis dispositum.

1. Trichotropis bicarinata
2. Its Operculum
3. Trichotropis unicarinata.

Linnæus and the earlier writers had so few opportunities of obtaining the soft and living parts of the Mollusca, that they were contented to classify them according to the external form and development of their shells. The distribution which they adopted in this emergency, being nevertheless executed with judgement, has proved in some instances to have been tolerably correct; but their method of associating in one division all shells of a tubular construction did certainly involve a most singular anomaly of organization. It may have been already noticed how perfectly distinct from each other are the *Serpulæ*, the *Aspergilla*, the *Vermeti*, the *Dentalia*, and the *Siliquariæ*; and we shall now show that the Magilus differs as essentially as any of them from the character that was at first attributed to it. The shell of Magilus has indeed most singularly taxed the ingenuity of naturalists to discover the nature and affinities of its animal inhabitant; for whilst De Montford, when establishing the present genus for its reception, included it with the *Mollusca*, Lamarck and others referred it to a place amongst the *Serpulaceous Annelides*. It has been classified with the *Mollusca*, however, only on account of an imaginary affinity with the *Vermeti*; no one could have suspected it to be an isolated and extraordinary modification of a true pectinibranchiate gastropod, as lately discovered by Rüppell. The Magilus was found by that indefatigable Abyssinian traveller on the shores of the Red Sea imbedded in a particular kind of madrepore, and its peculiarities minister in a surprising manner to the nature of its existence. The formation of the shell commences in the same style of volution as the rest of the Purpurifera; but, that the animal may retain free communication with the surrounding fluid, and keep pace at the same time with the increase of the madrepore, it raises itself by depositing a sufficiently abundant secretion of calcareous matter to completely solidify the early portion of the shell. The mollusk and its shell then leaves the spiral plan of construction, advancing in a straight or flexuous direction with the increase of the madrepore, and, as the revolved portion of the shell is immoveably imbedded, the new method of growth could only be effected by this extraordinary effusion of calcareous matter. The soft parts of the Magilus do not exceed an inch and a half to two inches in length, but the shell varies from two to fifteen

inches, according to the increase of the madrepore in which it became first imbedded.

The shell of Magilus may be described as being white, very solid, rolled into an ovate spire for three or four whorls, and then continued in a straight or flexuous direction, so as to form a tube varying in length according to circumstances; the tube is produced at the lower part into a kind of keel arising from a corresponding siphon in the mantle, and the surface of the shell altogether is generally rough and lamellated. The operculum is small, horny, elliptical, and disposed in subconcentric striæ.

Example.

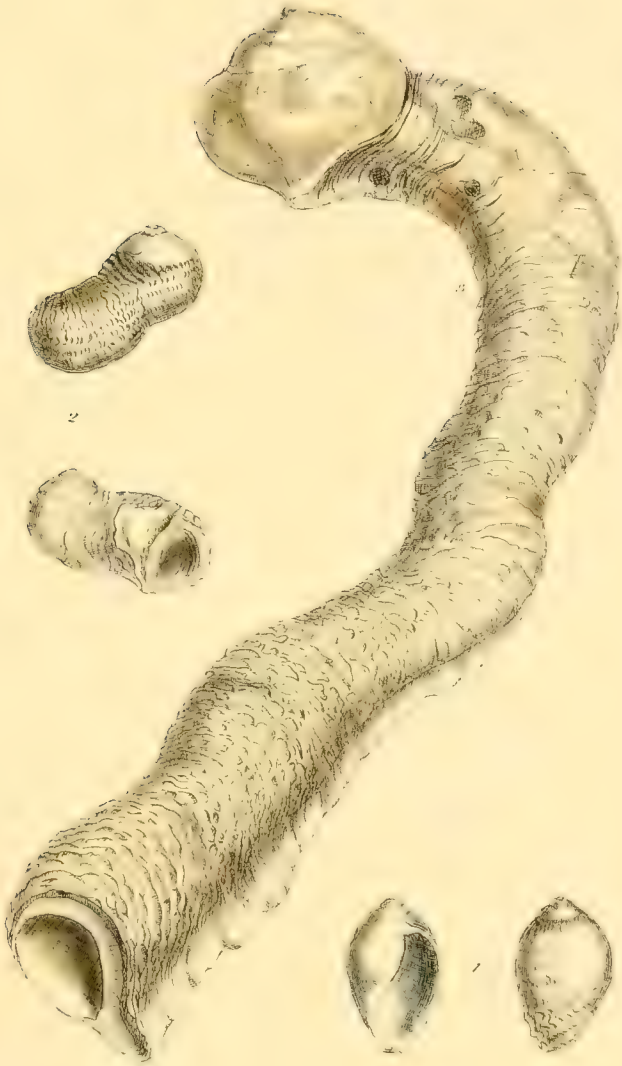
Pl. CCLXVI. Fig. 2 and 3.

MAGILUS ANTIQUUS, De Montford, Conchyliologie Systématique, vol. ii. p. 43. pl. 42. Rüppell, Mémoire sur le *Magilus antiquus*, f. 1 to 5.
Le Campulote, Guettard.

LEPTOCONCHUS, Rüppell.

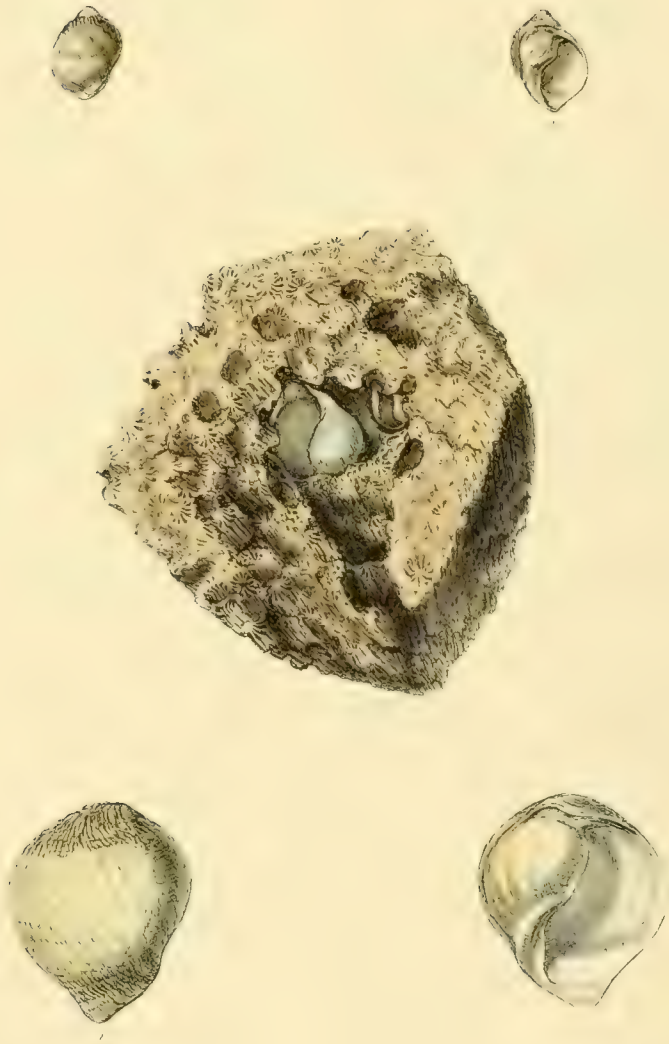
Testa subglobosa, fragilis, translucida, longitudinaliter striata, spirâ depressâ, subobsoletâ, anfractibus regulariter convexis, ultimo ventricoso, inflato; aperturâ concentrico-ovali, infernè subsinuatâ, marginibus supernè disjunctis; columellâ indentatâ, leviter truncatâ; labro tenui, acuto. Operculum nullum.

Another mollusk was found by Rüppell on the shores of the Red Sea whilst searching for *Magilus*, participating with the habits of that animal, inasmuch as it lives imbedded in the same description of madrepore. Its shell, however, which is of a particularly light and fragile nature, does not exceed the ordinary measure of growth; it differs in not having the margins of the aperture united, and is moreover destitute of any operculum. It has been supposed by Rang and others, that this mollusk, which Rüppell distinguished with the new title of *Leptoconchus*, is merely the



1. *Magilus ellipticus*
2, 3 *antiquus*

Plate CCLXVII.



Magilus in an early stage of growth * ; but the particulars which that author gives of its anatomy, together with the differences which have been remarked in the shell, are fully conclusive of its separate and distinct nature.

The shell of Leptoconchus may be described as being somewhat globose, fragile, transparent, and longitudinally striated ; the spire is depressed or nearly obsolete, and the whorls are regularly convex, the last being ventricose, and inflated ; the aperture, which is concentrically oval, is a little sinuated at the base, and the margins are superiorly disjoined ; the columella is indented, and very slightly truncated ; and the outer lip is thin, acute, and somewhat contracted towards the lower part.

Example.

Pl. CCLXVII. Fig. 1 to 5.

LEPTOCONCHUS STRIATUS, Rüppell, Transactions of the Zoological Society of London, vol. i. p. 259. pl. 35. f. 9 and 10.

BUCCINUM, Linnæus.

Testa ovata, vel oblonga, interdum subturrita, ad basem aut emarginata, aut leviter canaliculata ; spirâ elatâ, apice subobtuso ; aperturâ orbiculari, supernè angulatâ ; columellâ crassiusculâ, lævi, plus minusve expansâ, in mucronem desinente ; labro externo subreflexo, interdum crenato, processu dentiformi ad inferiorem partem rarò armato ; fauce nonnunquam leviter sulcatâ. Operculum corneum.

The title of Buccinum or Trumpet was applied indiscriminately by the ancients to shells of the most anomalous character ; indeed Linnæus may be said to have been the first to make a pure generic appropriation of it. His genus Buccinum still, however, included a numerous assemblage of species ; the whole of the Purpurifera then known were referred to this single generic division, and presented, therefore, abundant material for

* The *Magilus ellipticus*, Sowerby, may probably be one of these.

the many genera into which they have been distributed by succeeding writers. Bruguière and Lamarck have been the chief promulgators of the subsequent alterations, and there are three genera, *Cyllene*, *Pollia*, and *Bullia*, introduced by Gray, which yet remain to be appreciated. The last of these, *Bullia*, is certainly the best entitled to notice; it distinguishes a somewhat numerous and characteristic series partaking of the characters of the *Terebræ*.

The shell of Buccinum may be described as being ovate, or oblong, and occasionally somewhat turrited, with the base either emarginated, or slightly canaliculated; the spire is elevated, and rather sharp at the apex; the aperture is orbicular, and angulated at the upper part, and the columella, which is thick, and mostly smooth, is widely expanded, and ends in a point; the outer lip is a little reflected, sometimes crenated, and often armed towards the lower part with a slight, dentiform process; the interior of the shell is in some instances lightly sulcated, and the operculum is horny.

Examples.

Pl. CCLXVIII. Fig. 1.

Buccinum pyrostoma, *Nobis*, Proceedings Zool. Soc., 1842.
Phos pyrostoma?

Pl. CCLXVIII. Fig. 2.

Buccinum undosum, Linnæus, Syst. Nat., p. 1203. Lister, Historia Conchyliorum, pl. 938. f. 33. Kiener, Iconographie des Coquilles vivantes, pl. 12. f. 41. *a*, *b*, *c*.
Nassa undosa, Martini.
Buccinum affine, Gmelin.
Triton undosum, Lamarck.

Pl. CCLXVIII. Fig. 3.

Buccinum elegans*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLXVIII. Fig. 4.

Buccinum moniliferum, Valenciennes. Kiener, Iconographie des Coquilles vivantes, pl. 3. f. 8.

* From the collection of R. B. Hinds, Esq., R.N.

Plate CCLXVIII.

Pl. CCLXVIII. Fig. 5 and 6.

BUCCINUM SERRATUM, Dufresne. Kiener, Iconographie des Coquilles vivantes, pl. 9. f. 28.

Nassa Northiæ? Gray.

Pl. CCLXVIII. Fig. 7.

BUCCINUM MELANOSTOMA, Sowerby, Genera of Shells, No. 25. Wood, Index Testaceologicus, Supplement, pl. 4. f. 3.

NASSA, Lamarck.

Testa ovata, subturrita, in sinum profundum, aut canalem brevissimum, reflexum, desinens; spirâ elatâ, apice acuto, anfractibus costis longitudinalibus sæpissimè plus minusve ornatis; aperturâ orbiculari, supernè angulatâ; columellâ lævi, interdum latissimè effusâ, denticulo, aut callositate, ad superiorem partem instructâ; labro externo dentato; fauce leviter crenulatâ. Operculum parvum, corneum.

The genus Nassa is one which Lamarck introduced in his multifarious distribution of the Linnæan *Buccina*, with the view of distinguishing a certain portion whose shells exhibit an interesting and well-defined peculiarity of character. It has been subject, however, to much alteration at the hands of subsequent authors; the Nassæ (a term, by the bye, used by Martini in reference to many shells that are not referable to the present genus,) run so completely into the *Buccina*, that Lamarck himself only latterly acknowledged them as a section of the normal group. Kiener follows the same view, but De Montford has instituted a still further subdivision in the formation of the genera *Phos*, *Alectryon* and *Cyclops*; others too have been proposed by Gray*.

* Mr. Gray has far exceeded the labours of his talented predecessor in this respect; he seems, indeed, to follow every genus that can have the slightest modification of character to support it; an arrangement well adapted for those whose collections are confined to the typical

The shell of Nassa may be described as being ovate, somewhat turrited, and terminating at the base with either a sinus, or very short, reflected canal; the spire is somewhat raised, and sharp at the apex, and the whorls are generally more or less ornamented with longitudinal ribs; the aperture is orbicular, and angulated at the upper part; and the columella, which is smooth, and sometimes very widely spread over with enamel, is furnished near its junction with the body whorl with either a callosity or blunt, dentiform plait; the outer lip is dentated, and the interior is slightly crenulated. The operculum is horny.

Examples.

Pl. CCLXIX. Fig. 1.

Nassa arcularia, Lamarck, Encyclopédie Méthodique, pl. 394. f. 1 and 2.
Martini, Conch., pl. 41. f. 409 to 412.
Arcularia major, Rumphius.
Buccinum arcularia, Linnæus. Kiener.

Pl. CCLXIX. Fig. 2.

Nassa Thersites, Lamarck, Encyclopédie Méthodique, pl. 394. f. 8. *a*, *b*.
Martini, Conch., pl. 41. f. 413.
Arcularia minor, Rumphius.
Buccinum Thersites, Bruguière. Kiener.

Pl. CCLXIX. Fig. 3.

Nassa neritea, Lamarck, Encyclopédie Méthodique, pl. 394. f. 9. *a*, *b*.
Chemnitz*, Conch., vol. v. pl. 166. f. 1602.
Buccinum neriteum, Bruguière.
Cyclops asterizans, De Montford.

species of such divisions. Of the many genera included in his family of *Buccinidæ*, there are, however, several, such as *Cythara, Quoyia, Demoulia, Ringicula, Litiopa, Lamprodoma, Agaronia, Scaphula, Olivella*, &c., which we cannot judge of, as we have yet to learn the characters which entitle them to distinction.

* Chemnitz appears to have confounded this shell with the *Rotellæ*.

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1. *Nassa arcularia.*
2. ..... *Thersites.*
3. ..... *neritea.*
4. *N. clathrata.*
5. ... *papillosa.*
6. ... *globosa.*

Pl. CCLXIX. Fig. 4.

NASSA CLATHRATA*, Encylopédie Méthodique, pl. 394. f. 5. *a*, *b*. Sowerby, Genera of Shells, No. 25.

Buccinum gemmulatum, Lamarck.

Pl. CCLXIX. Fig. 5.

NASSA PAPILLOSA, Sowerby, Genera of Shells, No. 25. Martini, Conch., vol. iv. pl. 125. f. 1204 and 1205.

Buccinum papillosum, Linnæus. Lamarck.

Pl. CCLXIX. Fig. 6.

NASSA ABBREVIATA, *Nobis*.

Buccinum abbreviatum, Chemnitz, Conch., vol. x. p. 194. pl. 153. f. 1463 and 1464. Wood, Index Testaceologicus, pl. 22. f. 12. Kiener, Iconographie des Coquilles vivantes, pl. 26. f. 105.

Nassa globosa, Sowerby.

PLANAXIS, Lamarck.

Testa solida, ovato-conica, sinu perangusto terminata; spirâ subacutâ; aperturâ ovato-oblongâ; columellâ lævi, callo supernè instructâ, basi depressâ, truncatâ; labro externo leviter incrassato, fauce sulcatâ, aut lineatâ. Operculum tenue, corneum.

Lamarck very naturally observes, when describing the characters which entitle the Planaxes to rank as a genus, that they exhibit a strong affinity with the *Buccina* and *Purpuræ*; why then did he so indiscreetly arrange them between the *Turbines* and the *Phasianellæ*? The Planaxes differ from both these genera, not only in having their shells sinuated at the base, but

* Care must be taken not to confound this species with the *Buccinum clathratum* of Bruguière, nor with the *Buccinum clathratum* of Kiener, the latter of which is the *Buccinum globulosum* of Quoy.

in the columella being truncated. Deshayes places them, on account of this last-mentioned peculiarity, with the *Melanopsides*, but the difference in the habits of those mollusks is alone sufficient to determine the impropriety of their being associated together. The learned author of the 'Manuel de Malacologie' likewise attaches but little importance to the difference in the habits of mollusks as affecting their classification; we fully estimate his method of referring the Planaxes to his family of the *Entomostomata* in approximation to the *Buccina*, but not of removing the *Melanopsides* with them.

The shell of Planaxis may be described as being solid, ovately-conical, and notched at the base with a very narrow sinus; the aperture is ovately-oblong; the columella is smooth, depressed towards the base, and truncated, and it has always a wide callosity at the upper part; the outer lip is for the most part thickened, and the interior of the shell is either sulcated or lined.

Examples.

Pl. CCLXX. Fig. 1.

PLANAXIS SULCATUS, Lamarck, Anim. sans vert., vol. vii. p. 51. Lister, Historia Conchyliorum, pl. 980. f. 39.
Buccinum sulcatum, Bruguière.

Pl. CCLXX. Fig. 2.

PLANAXIS MOLLIS, Sowerby, Genera of Shells, No. 12.

Pl. CCLXX. Fig. 3.

PLANAXIS SEMISULCATUS, Sowerby, Genera of Shells, No. 12.

EBURNA, Lamarck.

Testa oblongo-ovata, spirâ acuminatâ, anfractibus plus minusve convexis, suturis plus minusve canaliculatis; anfractu ultimo canali brevissimo terminato, umbilicum amplum formante; aperturâ subovali; colu-

1 [illegible]
2 *mollis*
3 [illegible]

Plate CCLXXI.

mellâ lævi, subarcuatâ; labro externo simplici, acuto. Operculum corneum, parvum.

The word Eburna (from *ebur*, ebony or ivory,) was selected for this genus by Lamarck on account of the very high natural polish of one of the shells which he referred to it; one that was, however, referred to it from no other cause than the presence of an umbilicus, a character rarely to be relied on. This shell, his *Eburna glabrata*, has been the cause of no little confusion amongst conchologists; for instead of presenting the same characters as the rest of the Eburnæ, it exhibits precisely those of the *Ancillariæ*, and a notion thence arose amongst authors that the latter ought to be regarded as the Eburnæ, whilst the species commonly retained under that title should either be distinguished by a new name, or carried back to their original place amongst the *Buccina*. Eburna is undoubtedly an inappropriate name for the shells under consideration, for they are generally coated with a thick epidermis; whilst for the *Ancillariæ*, on the contrary, no appellation could be better; custom, however, sanctions the application of it, and we cannot, therefore, do better than observe the arrangement which has been adopted by Sowerby in his 'Species Conchyliorum,' in imitation of Swainson. The *Eburna glabrata* of Lamarck is there included with the *Ancillariæ*, leaving the rest of his Eburnæ undisturbed. The operculum is small, horny, and slightly hooked.

Examples.

Pl. CCLXXI. Fig. 1.

EBURNA JAPONICA*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLXXI. Fig. 2.

EBURNA PAPILLARIS, Sowerby, Appendix to Tankerville Catalogue, p. 22. Conchological Illustrations, f. 9.

* Cabinet of H. Cuming, Esq.: found on the sands at Japan by Dr. Siebald.

Pl. CCLXXI. Fig. 3.

EBURNA SPIRATA, Lamarck, Anim. sans vert., vol. vii. p. 282. Encyclopédie Méthodique, pl. 401. f. 2. *a, b.* Kiener, Iconographie des Coquilles vivantes, pl. 1. f. 1.

Buccinum spiratum, Linnæus.

Nassa umbilicata, Martini.

Pl. CCLXXI. Fig. 4.

EBURNA VALENTIANA*, Swainson, Zoological Illustrations, vol. iii. pl. 144.

Pl. CCLXXI. Fig. 5.

EBURNA LUTOSA, Lamarck, Anim. sans vert., vol. vii. p. 282. Encyclopédie Méthodique, pl. 401. f. 4. *a, b.* Kiener, Iconographie des Coquilles vivantes, pl. 3. f. 6.

ANCILLARIA, Lamarck.

Testa polita, oblonga, subcylindrica, basi effusâ, nonnunquam emarginatâ, varice subobliquo ornatâ; spirâ aut brevi, aut elongatâ, suturis ferè oblitis, anfractu ultimo inflato, rarò umbilicato; aperturâ amplâ, plus minusve dilatâ; columellâ tumidâ, callosâ, leviter tortuosâ; labro externo tenui, simplici, acuto. Operculum tenue, parvum, acuminatum.

The genus Ancillaria was instituted by Lamarck for the reception of a small group of mollusks allied to, and greatly resembling the *Olivæ*; their shells are, however, wider and more expanded towards the base; the last

* The author of the 'Iconographie des Coquilles vivantes' disposes of those very remarkable species, the *Eburnæ papillaris* and *Valentiana*, the ornaments of our cabinets, by quoting them as accidental varieties of the common *Eburna spirata*; a circumstance which strongly proves the injudicious policy of registering opinions that are formed from the mere examination of a drawing. His remarks in regard to Sowerby's *Eburnæ plumbea* and *australis* are better entitled to consideration; indeed we think with him that they are not *Eburnæ* at all.

Plate CCLXXII.

whorl sometimes forms an umbilicus, and the sutures between the whorls are nearly obliterated by the abundant deposition of enamel. *Ancilla* was the word originally used in application to this genus; but as the French authors were fearful of confounding their *Ancilles* with their *Ancyles* (Ancylus), De Roissy substituted the appellation of *Anaulax*, and the author of the genus exchanged it for that which is now universally followed.

The shell of Ancillaria may be described as being highly polished, oblong, somewhat cylindrical, and either notched or emarginated at the base, which is ornamented with an oblique varix; the spire is either short, or elongated, the sutures being almost entirely filled up with enamel, and the last whorl is inflated, and sometimes, though very rarely, umbilicated; the aperture is large, and more or less dilated; the columella is swollen, callous, and slightly twisted, and the outer lip is thin, simple and acute. The operculum is horny and acuminated.

Examples.

Pl. CCLXXII. Fig. 1 and 2.

ANCILLARIA AUSTRALIS, Sowerby, Species Conchyliorum, Part I. f. 44 to 46.

Pl. CCLXXII. Fig. 3.

ANCILLARIA MAURITIANA, Sowerby, Species Conchyliorum, Part I. f. 1 and 2.

Pl. CCLXXII. Fig. 4 and 7.

ANCILLARIA GLABRATA*, Swainson, Journ. of Science, vol. xviii. p. 285. Sowerby, Species Conchyliorum, Part I. f. 60 to 64.

Eburna glabrata, Lamarck.

Fig. 4. var. balteata.

Ancillaria balteata, Sowerby, Species Conchyliorum, Part I. f. 56 and 57.

Eburna balteata, Sowerby, Genera of Shells, No. 19. f. 3 and 4.

* We have figured a small operculated specimen of this shell from the cabinet of the Rev. Mr. Stainforth, for the sake of establishing a fact which has hitherto been disputed; namely, that the Ancillariæ are provided with an operculum.

Pl. CCLXXII. Fig. 5.

ANCILLARIA MARGINATA, Lamarck, Anim. sans vert., vol. vii. p. 413. Encyclopédie Méthodique, pl. 393. f. 2. *a*, *b*. Sowerby, Species Conchyliorum, Part I. f. 40 to 43.

Pl. CCLXXII. Fig. 6.

ANCILLARIA RUBIGINOSA, Swainson, Journ. of Science, vol. xviii. p. 283. Zoological Illustrations, 2nd series. Sowerby, Species Conchyliorum, Part I. f. 49 to 52.

Pl. CCLXXII. Fig. 8.

ANCILLARIA CASTANEA, Sowerby, Species Conchyliorum, Part I. f. 20 to 23.

Ancillaria ventricosa, var., Swainson.

OLIVA, Bruguière.

Testa polita, oblonga, subcylindrica, basi emarginatâ; spirâ brevi, apice acuto, anfractibus confertim volutis, suturis plus minusve canaliculatis; aperturâ perangustâ, propè ad apicem extensâ; columellâ sulcato-striatâ, subtumidâ, sæpè obliquè contortâ; labro externo, simplici, interdum crassiusculo.

The Olivæ have been associated together by all writers since the time of Gualtieri, with the exception of Linnæus. The great author of the 'Systema Naturæ' was so struck with the close approximation of the species of this genus to each other, that he referred the whole of them under one common title to his genus *Voluta*; supposing the columellar sulci to be analogous to the plaits upon which he founded that division. There is no genus throughout the system that may be said to offer so many obstacles to the proper determination of the species as that which we have now under consideration; they run so completely the one into the other, whether in regard to form, or distribution of colour, that few naturalists have ventured to make a particular study of them. The latest

1. *Oliva Porphyria*
2 ..... *Maura.*
3 ..... *subulata*
4 *Clavula*

attempt to effect a monograph of this genus is that lately made by Duclos: it, however, still remains to be completed.

The Olivæ, together with the *Ancillariæ*, were arranged by Lamarck and his contemporaries in the family of the *Columellata* after the genus *Terebellum*; but in consequence of the great affinity which exists between the *Ancillariæ* and the *Eburnæ*, they were removed with them by Gray to a place amongst the *Purpurifera*.

The shell of Oliva may be described as being very highly polished, and of an oblong, somewhat cylindrical form, the base being slightly emarginated, whilst the spire is short, and pointed at the apex; the whorls are very closely rolled over each other, and the suture running between them is more or less canaliculated, and said to contain a certain filament of the mantle; the aperture is very narrow, extending nearly to the top of the shell; the columella is sulcated, or striated, somewhat swollen, and often obliquely twisted; and the outer lip is simple, and sometimes rather thick.

Examples.

Pl. CCLXXIII. Fig. 1.

Oliva porphyria, Lamarck, Anim. sans vert., vol. vii. p. 418. Encyclopédie Méthodique, pl. 361. f. 4. *a*, *b*.
Cylinder porphyreticus, D'Argenville.
Castra Turcica, Martini.

Pl. CCLXXIII. Fig. 2.

Oliva maura, Lamarck, Anim. sans vert., vol. vii. p. 420. Encyclopédie Méthodique, pl. 366. f. 2. *a*, *b*.
Cylinder niger, Rumphius.
Dactylus niger, Klein.
Olea niger, D'Argenville.
Vidua Mauritiana, Martini.

Pl. CCLXXIII. Fig. 3.

Oliva subulata, Lamarck, Anim. sans vert., vol. vii. p. 435. Encyclopédie Méthodique, pl. 368. f. 6. *a*, *b*.

Pl. CCLXXIII. Fig. 4. (fossil).

OLIVA CLAVULA, Lamarck, Anim. sans vert., vol. vii. p. 440.

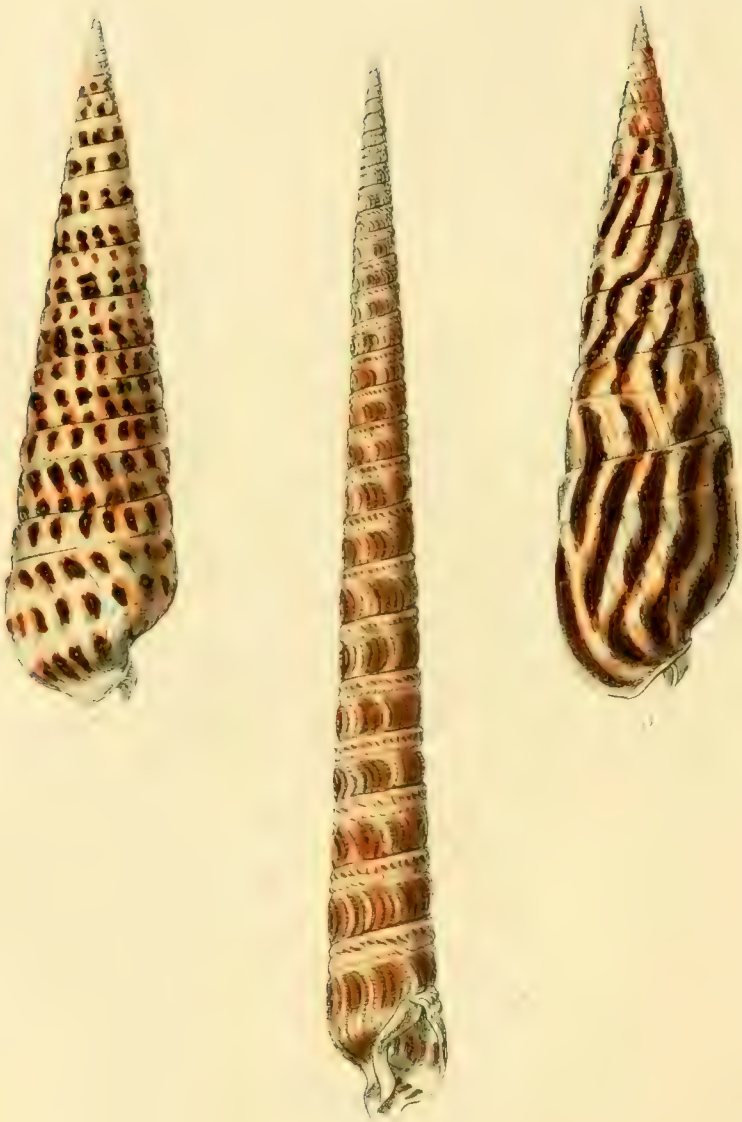
TEREBRA, Bruguière.

Testa elongata, turriculata, ad basem leviter canaliculata, anfractibus numerosis, parùm convexis, apice acutissimo, elato; aperturâ parvâ, suboblongâ, supernè angulatâ; columellâ tumidâ, contortâ, mucrone terminatâ; labro externo, simplici, tenui, acuto. Operculum corneum, non spirale.

The formation of the genus Terebra appears to have been for the most part attributed to Adanson; but as it was conceived by that author in error, his successor Bruguière has been sometimes signalised as the founder of it. The *Fusus Nifat*, for example, constituted one of the Terebræ of Adanson; indeed, of the species enumerated by that writer, so useful in his day, only two were selected by Bruguière as presenting the typical and proper characteristics of a new genus.

The shells of the Terebræ scarcely differ from those of the *Buccina*, except in their slender turriculated growth; there is, indeed, a numerous and interesting series approximating so closely to them in their generic characters, that it is difficult to determine on which side to place them. De Blainville at one time proposed to reserve these intermediate varieties of form to the genus under consideration; and he referred such as we now look upon as most typical, to a new genus, with the title of *Subula*. A similar arrangement has also been promulgated by Gray, but with this difference; he refers the subulate species to the genus Terebra, and the buccinoid species, including some of the Lamarckian *Buccina*, are associated under the new generic title of *Bullia**.

* The word *Bullia* has been changed by Gray, in his references to 'The figures of Molluscous Animals,' executed by his kind-hearted and accomplished lady, to *Bulliana*; and *Pollia* is changed in like manner to *Polliana*.



Terebra muscaria

The shell of Terebra may be described as being very elongated and turriculated, slightly canaliculated at the base, and composed of a number of scarcely convex whorls forming a narrow lengthened spire, which is very sharp at the apex; the aperture is small, somewhat oblong, and angulated at the upper part; the columella is swollen, twisted, and terminated with a point; and the outer lip is thin, simple, and acute. The operculum is horny, and not spiral.

Examples.

Pl. CCLXXIV. Fig. 1.

TEREBRA ORNATA, Gray, Proceedings Zool. Soc., 1834, p. 62.

Pl. CCLXXIV. Fig. 2.

TEREBRA PRETIOSA*, *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLXXIV. Fig. 3.

TEREBRA STRIGATA, Sowerby, Appendix Tankerville Catalogue, p. xxiii.
Buccinum elongatum, Wood.
Terebra zebra†, Kiener.

Pl. CCLXXV. Fig. 1.

TEREBRA SUBULATA, Lamarck, Anim. sans vert., vol. vii. p. 286. Kiener, Iconographie des Coquilles vivantes, pl. 4. f. 6.

Family 11. COLUMELLATA.

Testa ad basem emarginata, columellâ valdè plicatâ; plicis obliquis, infimis interdum minimis, interdum maximis.

* We gladly adopt the very appropriate title of *pretiosa*, proposed by the Rev. Mr. Stainforth, for this unique shell, one of the chief ornaments of his collection.

† Why has M. Kiener imposed a new title upon this species, when he admits, in a note immediately following his description, that it had been already named and described?

The family of the Columellata includes a small but rich series of mollusks, distinguished in great measure by the decided manner in which their shells are plaited on the columella. We say in great measure, because there are other mollusks differing most essentially both in their organization and habits, such as the *Auriculacea*, for example, whose shells exhibit the same important feature on the pillar-lip. But the Columellata will be found to agree in many other prominent peculiarities, and De Blainville includes them, together with the *Convoluta*, in one and the same family, *Angyostomata*; we think, however, the method adopted by Lamarck, of regarding them as separate groups, may be profitably followed. One genus, *Columbella*, was referred to this division by Lamarck, but we have shown it to have been misplaced; it was founded upon an erroneous association of character, and is one of the very few misappropriations of that great master of conchological science.

The shells of this group may be described as being emarginated at the base, for the passage of a stout proboscis, and strongly plaited on the columella, the lowest of these plaits being sometimes the largest, sometimes the smallest.

The family of the Columellata includes the six following genera:

Volvaria.	Voluta.
Marginella.	Melo.
Mitra.	Cymba.

VOLVARIA, Lamarck.

Testa longiuscula, subquadrato-cylindrica, ad basem leviter sinuata, extùs transversim striata, spirâ depressâ, penè occultâ; aperturâ perangustâ, testæ longitudinem æquante; columellâ rectâ, propè ad basem obliquè plicatâ, labro paululum denticulato.

The genus Volvaria was introduced by Lamarck in an early publication,

Plate CCLXXVI.

1. *Volvaria bulloides*
2 *convexa*
3 *acutiuscula*

his 'Système des Animaux sans vertèbres,' for the purpose of distinguishing a small cylindrical bulla-shaped fossil shell, having a close-set series of three plaits developed in an oblique direction at the very base of the columella, whilst the spire is depressed in such a manner as to be almost buried within the axis of the whorls. He entitled it the *Volvaria bulloides*, and was unacquainted with any other species of like character. In his latest work, 'Histoire des Animaux sans vertèbres,' however, he admitted one or two small recent species of *Marginella* into this genus Volvaria, and they have tended somewhat to confuse the majority of conchological writers. Kiener, in his 'Iconography of *Recent* Shells,' very naturally denounces the genus in question as unnecessary; and the removal of Lamarck's recent Volvariæ to a place amongst his *Marginellæ*, under the title of "*Les Marginelles volvairiformes*," may be estimated as a mark of good discretion,

Sowerby seems to have long ago detected the error which had been promulgated by Lamarck, for he relates in his 'Genera,' that after making a comparative examination of the little recent shells marked "Volvaria" by the learned professor in the Paris Museum, he "finds them much more nearly related to *Marginella* than to Volvaria."

The shell of Volvaria (known only in a fossil state*) may be described as being of a rather oblong-cylindrical form, slightly sinuated at the base, and transversely striated on the outside; the aperture is very narrow, and equals the entire length of the shell; the columella is straight, and obliquely plaited at the base, and the outer lip is denticulated.

Examples.

Pl. CCLXXVI. Fig. 1. (fossil).

VOLVARIA BULLOIDES, Lamarck, Syst. des Anim. sans vert., p. 93. De Montford, Conchyliologie Systématique, vol. ii. p. 411. Sowerby, Genera of Shells, No. 5.

* As we profess to include only such genera of shells in this arrangement as exist in a living or recent state, this single exception needs apology. We introduce the present genus in our anxiety to prevent the possibility of again confounding the true *Volvariæ* with the "*Marginelles volvairiformes*."

Pl. CCLXXVI. Fig. 2.

VOLVARIA CONCINNA, Sowerby, Genera of Shells, No. 5.

Pl. CCLXXVI. Fig. 3.

VOLVARIA ACUTIUSCULA, Sowerby, Genera of Shells, No. 5.

MARGINELLA, Lamarck.

Testa polita, ovato-oblonga, basi emarginatâ; spirâ brevi, nonnunquam depressâ, penè occultâ; aperturâ oblongâ, interdum testæ longitudinem æquante; columellâ subæqualiter plicatâ; labro externo marginato, crassatim revoluto.

The Marginellæ were separated from the Linnæan *Volutæ* by Lamarck, on account of the outer lip of their shells forming a solid marginal varix on arriving at maturity, their spire being depressed in such a manner that the aperture nearly equals the length of the entire shell, and their uniformly smaller size. And it is almost a matter of surprise that so marked an assemblage of good distinguishing peculiarities should have escaped the attention of Bruguière, who may be safely styled the first reformer of the Linnæan school. The Marginellæ are moreover the only mollusks of this family whose shells exhibit a bright enamel coating, like those of the *Cyprææ* and *Olivæ*, owing to their being entirely enveloped by the mantle. Adanson, indeed, confounded the *Olivæ* and Marginellæ together for this reason in one and the same genus, under the title of "Les Porcelaines"*; but that term was adopted by French writers in reference only to the *Cyprææ*. There are a number of species in this

* It is true that the soft parts of the *Olivæ* and *Cyprææ* are not unlike those of the *Marginellæ*; a comparison of their anatomical peculiarities will, indeed, scarcely warrant the separation of these three genera in three different families; the shells, however, exhibit characters really distinct from each other, and are, therefore, without any equivalent variation in their animal inhabitants.

In descending to species, we find many variations admitted to be of *specific* importance in

MARGINELLA.

Plate CCLXXVII

popular and much-admired genus, and many of them, though small, are of great rarity and beauty.

The shell of Marginella may be described as being polished, ovately-oblong, and emarginated at the base, the spire being short and depressed, sometimes nearly concealed ; the aperture is oblong, and in some instances equals the entire length of the shell; the columella is plaited nearly equally, and the outer lip is so thickly rolled back that it forms a solid marginal varix.

Examples.

Pl. CCLXXVII. Fig. 1.

MARGINELLA CLERYI, Petit, Magasin de Zoologie, 1836, pl. 73. Kiener, Iconographie des Coquilles vivantes, pl. 10. f. 3.

Pl. CCLXXVII. Fig. 2 and 3.

MARGINELLA SPLENDENS, (Humphrey, MSS.). *Nobis*, Proceedings Zool. Soc., 1842.

Pl. CCLXXVII. Fig. 4.

MARGINELLA NUBECULATA, Lamarck, Anim. sans vert., vol. vii. p. 356. Encyclopédie Méthodique, pl. 377. f. 2. *a*, *b*. Martini, Conch., vol. ii. pl. 42. f. 422 and 423.

Cucumis nubeculatus, Martini.

Pl. CCLXXVII. Fig. 5 and 6.

MARGINELLA ELEGANS, Kiener, Iconographie des Coquilles vivantes, pl. 8. f. 35. Martini, Conch., vol. ii. pl. 42. f. 424 and 425. Lister, Historia Conchyliorum, pl. 803. f. 11.

Pannus striatus, Martini.

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shells, when the animal inhabitants of those shells are the same in every respect. What, then, may we ask, constitutes a *species*, if only such forms are species that perpetuate themselves without exceeding peculiar and definable limits ? Is there a limit in the perpetuation of any form that is not endowed with intellect or reason ?

Pl. CCLXXVII. Fig. 7.

MARGINELLA LABIATA, Valenciennes. Kiener, Iconographie des Coquilles vivantes, pl. 11. f. 2.

Pl. CCLXXVII. Fig. 8 and 9.

MARGINELLA GOODALLI, Sowerby, Appendix Tankerville Catalogue, p. xxx. pl. 2. f. 2. Kiener, Iconographie des Coquilles vivantes, pl. 7. f. 29.

Pl. CCLXXVIII. Fig. 1.

MARGINELLA GLABELLA, Lamarck, Anim. sans vert., vol. vii. p. 355. Encyclopédie Méthodique, pl. 377. f. 6. *a*, *b*. Martini, Conch., vol. ii. pl. 42. f. 429.

Voluta glabella, Linnæus.

Cucumis ocellatus, Martini.

Pl. CCLXXVIII. Fig. 2.

MARGINELLA PERSICULA, Lamarck, Anim. sans vert., vol. vii. p. 361. Encyclopédie Méthodique, pl. 377. f. 3. *a*, *b*. Martini, Conch., pl. 42. f. 421.

Buccinum persicum parvum, Lister.

Voluta persicula, Linnæus.

Persicula fasciata, Martini.

MITRA, Lamarck.

Testa elongata, vel oblongo-ovata, aut turrita, aut fusiformis, ad basem emarginata; spirâ acuminatâ, plus minusve elatâ, apice subacuto; aperturâ angustâ, interdum testæ longitudinem ferè æquante; columellâ basem versus sæpè recurvâ, plicis infimis minimis; labro externo subincrassato, plerumque denticulato.

The Mitræ, whose shells have been long celebrated either for their ela-

Plate CCLXXVIII.

1 *Marginella Glabella*
2 *Persicula*
3 *marginata*

borate sculpture, or for their vivid display of colours, were separated by Lamarck from the Linnæan *Volutæ*; it must, however, be remembered that they were designated by the common appellatives of "the Bishop's Mitre," "the Pope's Mitre," "the Cardinal's Mitre," and so forth, by Klein, Rumphius, and many of the first naturalists after the revival of letters. They exhibit a much smaller average size, and are especially marked by a turriculated or fusiform uniformity of growth. They are further distinguished by the spire never being papillary, and by an important change in the disposition of the columellar plaits; in the *Volutæ* the plaits enlarge upon the columella as they descend, whilst in the Mitræ it is just the reverse, for they diminish materially in size as they approximate to the base of the shell. There have been one or two attempts to distribute the Mitræ into smaller genera. De Montford separated the *Mitra vulpecula*, and those allied to it, under the generic title of *Turris**; whilst Swainson divides the Mitræ into no less than five genera, *Mitra*, *Mitreola*, *Mitrella*, *Tiara* and *Conohelix*. The last of these, which includes the *Mitræ dactylus*, *marmorata*, and other short conical forms, had already been proposed by Schumacher with the name of *Imbricaria*, and has been much esteemed by conchologists; the division, nevertheless, exhibits no permanency of character, and cannot easily be maintained.

Some of the small species of Mitræ approximate closely in form and general appearance to the *Columbellæ*; indeed, a few of them were referred to that genus by Lamarck; they may, however, be readily distinguished by remarking the difference already explained between columellar plaits and mere plait-like denticulations (*vide* p. 216).

The shell of Mitra may be described as being elongated, or of an oblong-oval form, either turrited, cylindrical, or fusiform, and emarginated at the base; the spire is acuminated, more or less raised, and generally rather sharp at the apex; the aperture is narrow, and varies considerably in length, sometimes extending but half-way up the shell, and sometimes nearly equalling its length; the columella is often recurved towards the

* We observe another genus besides *Turris* in Mr. Gray's 'Synopsis,' with the name of *Vulpecula*: surely it must be the same?

base, and of the plaits the lowest are always the smallest; the outer lip is somewhat thickened, and slightly denticulated.

Examples.

Pl. CCLXXIX. Fig. 1.

MITRA EPISCOPALIS, D'Argenville, Conch., pl. 9. f. *c*. Lamarck, Anim. sans vert., vol. vii. p. 299.
Mitra Episcopi, Rumphius. Martini.
Buccinum engystomum, Regenfuss.

Pl. CCLXXIX. Fig. 2.

MITRA CARDINALIS, Gronovius, Zoophyl. Fasc., vol. iii. no. 1326 and 1327. Lamarck, Anim. sans vert., vol. vii. p. 301.
Pileus cardinalitius, Seba. Martini.
Voluta cardinalis, Gmelin.
Voluta pertusa? Linnæus.
Mitra pertusa, Sowerby.

Pl. CCLXXX. Fig. 3.

MITRA ADUSTA, Lamarck, Anim. sans vert., vol. vii. p. 303. Martini, Conch., vol. iv. pl. 147. f. 1361.
Tiara adusta, Martini.
Voluta pertusa, Gmelin.

Pl. CCLXXX. Fig. 4.

MITRA REGINA, Swainson. Chemnitz, Conch., vol. x. pl. 151. f. 1444 and 1445. Kiener, Iconographie des Coquilles vivantes, pl. 19. f. *a*.

Pl. CCLXXX. Fig. 5.

MITRA FISSURATA, Lamarck, Anim. sans vert., vol. vii. p. 311. Encyclopédie Méthodique, pl. 371. f. 1. *a*, *b*.

Pl. CCLXXX. Fig. 6.

MITRA OLIVARIA (?), Lamarck, Anim. sans vert., vol. vii. p. 305.

Plate CCLXXIX.

1. Mitra episcopalis.
2 pertusa.
3 adusta.

Plate CCLXXX.

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5

4. *Mitra Regina.*
5. *fissurata.*
6. *olivaria.*
7. *Dactylus*
8. *Conohelix marmorata.*

Pl. CCLXXX. Fig. 7.

MITRA DACTYLUS, Lamarck, Anim. sans vert., vol. vii. p. 314. Kiener, Iconographie des Coquilles vivantes, pl. 31. f. 103.
Cucumis crassus, Klein.
Cylindrus crassus, Seba.
Voluta dactylus, Linnæus.
Conohelix dactylus, Swainson.

Pl. CCLXXX. Fig. 8.

MITRA MARMORATA, Sowerby, Genera of Shells, No. 31. Quoy, Voyage de l'Astrolabe, pl. 45 *bis*. fig. 1 to 4. Kiener, Iconographie des Coquilles vivantes, pl. 34. f. 112.
Imbricaria ——? Schumacher.
Conohelix marmorata, Swainson.

VOLUTA, Linnæus.

Testa ovata, vel oblonga, ad basem emarginata, spirâ brevi, apice sæpissimè papillari; anfractibus aut lævibus, aut costellatis, interdum supernè coronatis; aperturâ oblongâ; columellâ incrassatâ, obliquè plicatâ, plicis infimis maximis; labro solido, parùm revoluto.

The genus Voluta was founded by Linnæus upon the single feature of a plaited columella, without reference to any accompanying character, and affords another instance of the great disadvantage under which that author laboured in his systematic arrangement of shells for want of a proper intimacy with the nature of their animal inhabitants. The Volutæ of the 'Systema Naturæ' included both carnivorous and herbivorous mollusks, terrestrial, freshwater and marine; the shells of the *Auriculæ*, for example, of the *Tornatellæ*, *Pyramidellæ*, *Turbinelli*, *Cancellariæ*, *Fasciolariæ*, *Columbellæ*, *Mitræ*, *Marginellæ*, *Olivæ*, &c., were all referred to this one genus on account of the columella being more or less plaited;

and it was not until the habits and organization of their animals were considered that the impropriety of this arrangement became manifest. Bruguière and Lamarck were the principal agents in effecting the necessary reform, and the genus Voluta, after having been dismembered as above noted, was handed to us by the last of those writers in a manner which left little to be desired. Broderip, however, one of the most cautious operators in modern conchology, and who has long made a particular study of these mollusks, distinguished that peculiar and very characteristic group, vulgarly called "the Melons" after the manner of De Montford; only with this difference, Broderip has instituted two genera (in which we readily concur with him), *Cymba* and *Melo*, whereas De Montford included them under one, *Cymbium*. The Volutæ have all very solid, well-developed shells; and many of them being of great rarity, they are eagerly sought after by collectors.

The shell of Voluta may be described as being ovate, or oblong, and emarginated at the base, the spire being short, and generally papillary at the apex; the whorls are either smooth, or ribbed, and they are sometimes coronated; the aperture is oblong; the columella is thickened and obliquely plaited, the lowest plaits being the largest; and the lip, which is solid in most species, is but slightly rolled back.

Examples.

Pl. CCLXXXI.

Voluta papillaris, Swainson, Zoological Illustrations. Sowerby, Genera of Shells, No. 29.

Voluta Soverbii, Kiener.

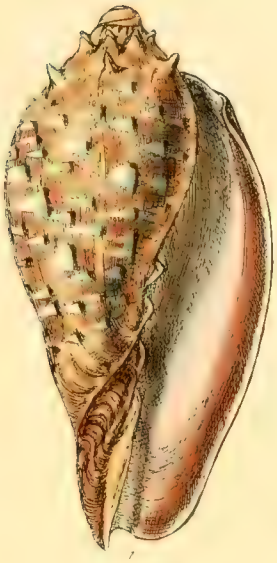
Pl. CCLXXXII. Fig. 1.

Voluta cymbiola, Chemnitz, vol. x. p. 141. pl. 148. f. 1385 and 1386. Sowerby, Tankerville Catalogue, pl. 4. fig. 1. Wood, Index Testaceologicus, pl. 21. f. 177.

Voluta flammula, Wood (Ind. Test. Supp. pl. 3. fig. 5.).

Voluta coronata, Kiener.

Voluta papillaris.



Pl. CCLXXXII. Fig. 2.

VOLUTA VOLVACEA, Lamarck, Anim. sans vert., vol. vii. p. 347. Martini, Conch., vol. iii. pl. 95. f. 922 and 923.
Voluta modesta? Wood.
Voluta punctata, Kiener.

Pl. CCLXXXII. Fig. 3.

VOLUTA RUTILA, Broderip, Zoological Journal, vol. ii. p. 30. pl. 3. f. 1 to 3.
Voluta aulica, Kiener*.

Pl. CCLXXXII. Fig. 4.

VOLUTA AULICA†, Solander, MSS. Sowerby, Appendix, Tankerville Catalogue, p. xxix.

MELO, Broderip.

Testa subovata, ampla, ventricosa, ad basem emarginata, spirâ brevi, apice papillari; anfractibus lævibus, spinis cameratis, compressis, sæpissimè coronatis; aperturâ amplâ; columellâ vix rectâ, plicis infimis maximis; labro tenui, simplici, acuto, nunquam revoluto.

De Montford suggested the formation of a very excellent genus, in his whimsical 'Conchyliologie Systématique,' with the title of *Cymbium*, for the reception of that portion of the Linnæan Volutes which were distinguished in the 'Systema Naturæ' as "*Volutæ ventricosæ*." Lamarck, however, chose not to adopt the suggestion of his fanciful contemporary, for he still regarded them as an important division only of the genus *Voluta*,

* The above species are selected (as the synonyms show) with the view of correcting the errors which have been added to the nomenclature of this genus by the author of the 'Iconographie des Coquilles vivantes.'

† This very beautiful and rare shell, collected by H. Cuming, Esq., at one of the Philippine Islands, is the specimen described by Broderip as var. β. in the 'Proceedings of the Zoological Society for 1842.'

under the sectional title of "Les Gondolières." The task of effecting a proper reformation in this portion of the Volutes was reserved for Broderip, and it is not without some consideration that we oppose ourselves to the too bigoted disciples of Lamarck in upholding his new arrangement. He regards them as susceptible of being divided into two very distinct and well-characterized genera, *Melo* and *Cymba*, and it is of the first of these which we have now to treat. The Melones or "Melons" have a fine ventricose shell, attaining in some instances a very large size; they are generally coronated with a handsome diadem of compressed vaulted spines, and exhibit for the most part a pleasant variety and distribution of pattern; the apex is moreover of a peculiarly papillary structure, and differs essentially from the rude and almost obsolete apex of the *Cymbæ*.

The shell of Melo may be further described as being nearly oval, and emarginated at the base; the aperture is large, the columella rather straight, the lowest plaits being the largest, and the lip is simple, acute, and never rolled back.

Example.

Pl. CCLXXXIII.

Melo diadema, Broderip. Martini, Conch., vol. iii. pl. 74. f. 780. Enclopédie Méthodique, pl. 388. f. 2.

Voluta diadema, Lamarck.

Voluta armata, var., Kiener.

CYMBA, Broderip.

Testa subampla, lævis, oblonga, vel ovata, admodum ventricosa, ad basem emarginata, interdum tegmine quasi vitreo partim vel omnino obducta; spirâ brevissimâ, apice rudi, interdum obsoleto; anfractibus lævibus, parte superiori concavâ, subito depressâ, spiræ apicem penè occultante; aperturâ vel ovatâ, vel elongatâ, columellâ

Plate CCLXXXIII.

Plate CCLXXXIV.

curvâ, plicis magnis, acutis; labro tenui, simplici, acuto, nunquam reflexo.

The Cymbæ or "Boat-Melons" are chiefly distinguished from the *Melones* or "Simple Melons" by the sudden concave angular depression of the upper part of the whorls; a kind of sutural shelf as it were is in fact thus formed around the upper portion of the spire, so as to obliterate in many instances all external trace of the apex.

Having detailed the history and origin of this genus in our observations on *Melo*, it only remains for us to describe the shell of Cymba as being of rather large size, smooth, oblong, or ovate, very ventricose, emarginated at the base, and sometimes covered with a kind of glazed vitreous pellicle; the spire is very short, with the apex rude, and occasionally obsolete; the aperture is sometimes ovate, sometimes elongated; the columella is curved, with the plaits large and acute, and the lip is thin, simple, and never reflected.

Example.

Pl. CCLXXXIV.

Cymba Neptuni, Broderip. Sowerby, Species Conchyliorum, Part I. p. 5. fig. 2. *a*, *b*, *c*, *d*. Martini, Conch., vol. iii. pl. 71. f. 767. Encyclopédie Méthodique, pl. 386. f. 1.
Patera Neptuni, Martini.
Voluta Neptuni, Lamarck.

Family 12. CONVOLUTA.

Testa ad basin emarginata, anfractibus confertim volutis, non descendentibus.

This interesting and highly esteemed group, constituting the last of the great series of pectinibranchiate gasteropods, was introduced by Lamarck

under the above title ("*Les Enroulés*"). It stands, however, as a family upon rather an artificial basis; the only distinctive character of the Convoluta is in the whorls of the shell being closely convoluted over each other without descending, so that the upper or sutural portion of them remains on a plane with the spire; and it is not without considerable reluctance that we follow the arrangement of our venerable predecessor. We feel our difficulty the more from having had occasion to remove two genera, *Oliva* and *Ancillaria*, to the family of the *Purpurifera*, on account of their affinity with the *Eburnæ*, whilst their shells exhibit the same disposition of growth which has been selected for the determination of this family; there is a difference of organization, too, between certain of the Convoluta, which seems scarcely to admit of their association. The *Cyprææ* have an unusually large mantle, which dividing into two unequal lobes entirely envelops the shell; the calcifying organ of the *Coni*, on the contrary, is comparatively small, and the hinder extremity of the foot is furnished with a minute operculum. The situation which should be assigned to the last of these genera has severely taxed the ingenuity of conchologists: Deshayes refers it to his family of the *Buccinidæ*; Gray to his family of the *Muricidæ*; whilst De Blainville includes it immediately after *Strombus*, in his family of the *Angyostomata*. The *Coni* have evidently few characters in common with the *Cyprææ*, and we shall no doubt be censured by many for our rigid adherence to an arrangement which is evidently at fault. It must be pleaded, however, that the anatomy and affinities of these mollusks are not yet sufficiently understood to induce us to hazard a removal.

We include five genera in this family:

Erato.	Terebellum.
Cypræa.	Conus.
Ovulum.	

ERATO, Risso.

Testa parva, ovato-oblonga, lævis, ad basin emarginata, spirâ subprominulâ, anfractu ultimo subinflato; aperturâ angustâ, columellâ labroque interdum per totam longitudinem denticulatis; margine externo incrassato, medianè tumido, supernè rotundato.

We are indebted to M. Risso, a distinguished conchologist of Nice, for the introduction of this important genus; important, because serving to establish a close affinity between two apparently very different genera. The genus Erato was proposed by that author for the sake of distinguishing a small shell from the Mediterranean, exactly intermediate in its characters between that of *Marginella* and *Cypræa*; but it may be distinguished from either on examination. Instead of the columella being plaited in all its several stages of growth, as in the former, it remains perfectly smooth until the shell arrives at maturity; the columella, together with the outer lip, then exhibit a number of fine denticulations, as in the *Cyprææ*, whilst the shell, with its rather elevated spire, retains the form and general appearance of the *Marginellæ*. It must, however, be remarked, that the peculiarity of character attached to the columella of this shell presents a considerable degree of modification in different species. Of the seven represented in our Plate, the columella in some almost assumes a plaited appearance; they may, nevertheless, be readily distinguished, and it is to be regretted that Kiener should have followed Payrandeau in confounding them with the *Marginellæ*. They form a well-marked and very decided link between the two families of the *Columellata* and the *Convoluta*, and certainly merit a generic notice, if only on that account.

A genus may be considered important if aiding to establish a connection between two seemingly distinct families, when it might otherwise be set down as frivolous and unnecessary; for the naturalist should labour diligently to display the harmony that exists between the several parts of

the system. He may delight in the identification of species, but should be careful to examine their relative affinities, and not be satisfied with the mere discovery of a difference in kind. By adopting the genus Erato we are brought to consider the relation between two apparently remote families, and at once discover an affinity between parts which before it seemed difficult to associate.

The shell of Erato may be described as being small, ovately-oblong, smooth, and emarginated at the base, the spire being rather prominent, and the last whorl somewhat inflated; the aperture is narrow, and both the columella and outer lip are denticulated, in some instances throughout their entire length; the margin of the latter is thickened, swollen towards the middle, and rounded at the upper part.

Examples.

Pl. CCLXXXV. Fig. 1.

Erato angistoma, Sowerby, Catalogue of Cypræadæ, p. 16. No. 7. Conchological Illustrations, f. 51.

Pl. CCLXXXV. Fig. 2.

Erato sulcifera, Gray. Sowerby, Catalogue of Cypræadæ, p. 15. No. 2. Conchological Illustrations, f. 46.

Pl. CCLXXXV. Fig. 3.

Erato lævis, Gray. Sowerby, Catalogue of Cypræadæ, p. 15. No. 3. Conchological Illustrations, f. 57.
Cypræa Voluta, Montague.
Voluta lævis, Donovan.
Marginella Donovani, Payrandeau.

Pl. CCLXXXV. Fig. 4.

Erato Maugeriæ, Gray. Sowerby, Catalogue of Cypræadæ, p. 15. No. 4. Conchological Illustrations, f. 47.

Plate CCLXXXV.

Pl. CCLXXXV. Fig. 5 and 6.

ERATO LACHRYMA, Gray. Sowerby, Catalogue of Cypræadæ, p. 15. No. 5. Conchological Illustrations, f. 48.
Lachryma trifasciata, Humphrey, MSS.

Pl. CCLXXXV. Fig. 7 and 10.

ERATO SCABRIUSCULA, Gray. Sowerby, Catalogue of Cypræadæ, p. 15. No. 1. Conchological Illustrations, f. 45.
Marginella cypræola, Sowerby.
Marginella granum, Kiener.

Pl. CCLXXXV. Fig. 8 and 9.

ERATO GUTTULA, Sowerby, Catalogue of Cypræadæ, p. 16. No. 6. Conchological Illustrations, f. 50.

CYPRÆA, Linnæus.

Testa ovata, vel oblongo-ovata, ventricosa, interdum polita, interdum nodifera, aut costellata, extremitatibus canaliferis, aut emarginatis; spirâ brevissimâ, partim vel omninò occultâ; aperturâ centrali, longitudinali, angustâ; columellâ labroque per totam longitudinem plus minusve denticulatis, interdum at rarò edentulis.

This favoured genus of mollusks is one of the very few adopted by Linnæus that remains entire; attempts have been made, it is true, to subdivide it both by De Montford and Gray, but the subdivisions of those ingenious writers have signally failed to be recognised. The harmony of character, as well as the constant similarity of form which the shells of these mollusks assume in the adult state, renders them at all times easy to be distinguished; there is, however, some little difficulty in identifying them in an early stage of growth. Great interest is found in the study of these animals in observing the gradual increase and development of the

shell, and noting the various gradations of form, pattern, and colour on arriving at different periods of their existence. It is only by the comparison of many specimens that the growth of a particular species can be traced; for on viewing the extremes of age apart, it is difficult to imagine the relation that actually exists between them. The shells of the young Cyprææ were figured by our forefathers as *Bullæ*; Adanson collected them in a separate genus, with the title of *Peribolus*; and a celebrated continental malacologist of the present day was some time before he could make up his mind to abandon it. The Cowries exhibit, too, changes of colour and pattern as well as of form, presenting at least two or three different coatings of enamel at different stages. They are for the most part only simply banded when young; the pattern which we commonly see upon the adult shell is not deposited until the growth is completed, and it is on this last deposit only that a dorsal line is often left, from the lobes of the mantle not closely meeting, as noticed in our observations at the commencement of the family.

Of the subdivisions mentioned as having been suggested by De Montford and Gray, one is a genus instituted by the former with the name of *Trivia* for the small sulcated species, such as the *Cyprææ pediculus, Europæa, Pacifica, sanguinea,* &c.; the others are two by the latter author, with the names of *Luponia* and *Cyprovula.* The first of these includes the *Cyprææ Algoensis, piperita,* and a few others; and the second contains that single remarkable species, the *Cypræa Capensis.*

The magnificent shell of the *Cypræa aurora* is worn as an ornament by the chiefs of some of the Pacific Islands even in the present day, and the well-known shell of the *Cypræa moneta* still passes current for money amongst the lower classes in some parts of Hindostan*.

The shell of Cypræa may be described as being of either an oval or oblong-oval shape, ventricose, sometimes polished, and sometimes nodiferous, or slightly ribbed; the extremities of the shell are canaliferous,

* A gentleman residing some time since at Cuttack is said to have paid for the erection of his bungalow entirely in these cowries. The building cost him about 4000 rupees sicca (400*l.* sterling); and as sixty-four of these shells are equivalent in value to one "pice," and sixty-four pice to a rupee sicca, he paid for it with above sixteen millions of these shells.

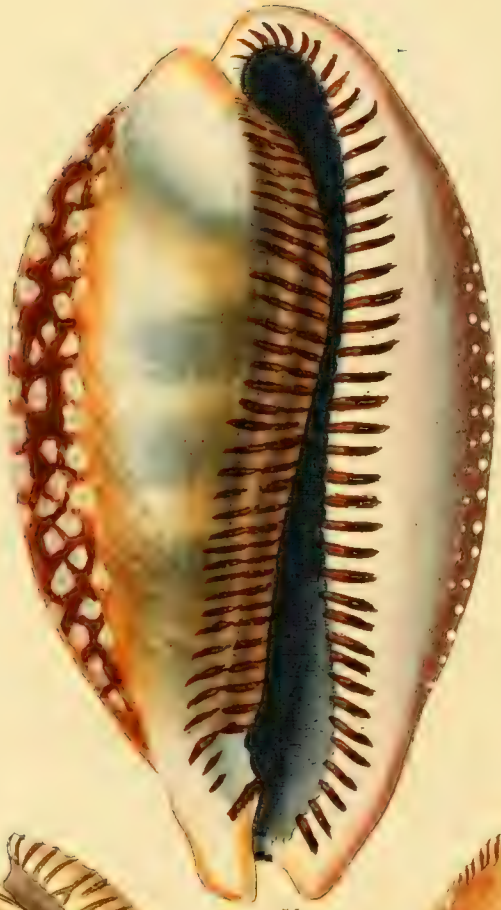
Plate CCLXXXVI.

Plate CCLXXXVII.

175

177

Plate CCLXXXVIII.



115

116

or emarginated, and the spire, which is very short, is either partially or altogether concealed by the subsequent deposits of enamel; the aperture is central, longitudinal, and narrow, and the columella, together with the outer lip, are more or less denticulated throughout their entire length; sometimes, however, though rarely, they are without teeth.

Examples.

Pl. CCLXXXVI. Fig. 141.

Cypræa aurora, Solander. Chemnitz, Conch., vol. xi. pl. 180. f. 1737 and 1738.

Cypræa aurantium, Martyn. Gmelin.

Pl. CCLXXXVI. Fig. 145.

Cypræa ovulata, Lamarck, Anim. sans vert., vol. vii. p. 398. Encyclopédie Méthodique, pl. 355. f. 2. *a*, *b*.

Cypræa lota, Wood.

Pl. CCLXXXVI. Fig. 146.

Cypræa radians, Lamarck, Anim. sans vert., vol. vii. p. 402.

Cypræa oniscus, Wood.

Trivia radians, Gray.

Pl. CCLXXXVI. Fig. 147.

Cypræa rosea, Gray. Wood, Index Testaceologicus, Supp., pl. 3. f. 15.

Cypræa carnea, Sowerby.

Pl. CCLXXXVI. Fig. 148.

Cypræa pediculus, Linnæus (Gmelin), Syst. Nat., p. 3418. Lamarck, Anim. sans vert., vol. vii. p. 403. Encyclopédie Méthodique, pl. 356. f. 1. *a*.

Cypræa sulcata, Wood.

Pl. CCLXXXVII. and Pl. CCLXXXVIII. Fig. 175.

Cypræa cervina, Lamarck, Anim. sans vert., vol. vii. p. 375. Chemnitz, Conch., vol. x. pl. 145. f. 1343.

Cypræa exanthema, var., Chemnitz.
Cypræa oculata, Gmelin.
Cypræa cervus, Sowerby.

Pl. CCLXXXVII. Fig. 176. and Pl. CCLXXXIX. Fig. 178.

CYPRÆA LEUCODON*, Broderip, Zoological Journal, vol. iv. pl. 5.

Pl. CCLXXXVIII. Fig. 176.

CYPRÆA GUTTATA†, Gray, Zoological Journal, vol. ii. pl. 18. f. 1 and 2.

Pl. CCLXXXIX. Fig. 179.

CYPRÆA ACHATIDEA, Gray, MSS. Sowerby, List of Cypræadæ, No. 179.

Pl. CCLXXXIX. Fig. 180.

CYPRÆA SUBVIRIDIS, *Nobis*, Proceedings Zool. Soc., 1835, p. 68.
Cypræa errones, var., Sowerby.

Pl. CCLXXXIX. Fig. 181.

CYPRÆA CUMINGII‡, Gray. Sowerby, Catalogue of Cypræadæ, No. 77.

OVULA, Bruguière.

Testa ovata, vel oblongo-ovata, polita, extremitatibus vel emarginatis, vel in canales plus minusve productis; spirâ brevissimâ, occultâ; aperturâ longitudinali, sæpè medianè latiore; columellâ edentulâ; labro

* This very remarkable and unique shell is now in the British Museum.

† We have only seen two specimens of this beautiful Cowry, one in the British, and the other in the Leyden Museum.

‡ A magnificent specimen in the collection of H. Cuming, Esq.

Plate CCLXXXIX.

incrassato, involuto, nunc lævi, nunc denticulato, rarissimè tenui, acuto.

Bruguière became entitled to the credit of being the founder of this genus, but he did little more than honour the Ovulæ with a separate generic name; for as Linnæus regarded them as a section of the genus *Bulla*, so were they left by his successor in the same ill-chosen situation. Lamarck soon detected their affinity with the *Cyprææ*; and when the soft parts of these mollusks had been properly examined by De Blainville, the indefatigable naturalists who collected them, MM. Quoy and Gaimard, ventured to assert that "la considération de l'animal de l'Ovule exige presque la réunion de ce genre avec celui des Porcelaines." This opinion, however, was never acted upon; the Ovulæ constitute a good and very natural genus, and a full exposition of it has been ably given by Sowerby in the first Part of his 'Species Conchyliorum.'

De Montford, in his prolific notions of generic division, has distributed the Ovulæ into no less than four genera, separating the three following from those which he reserves under the normal title; the *Ovula verrucosa*, with the new appellation of *Calpurnus*; the *Ovula volva*, with that of *Radius*; and the *Ovula gibbosa*, with that of *Ultimus**; another genus, too, has been proposed by Dr. Leach under the name of *Simnia*.

The shell of Ovula may be described as being of an oval, or oblong-oval form, with the extremities either emarginated, or canaliculated to a greater or less extent; the spire, which is very short, is entirely concealed within the axis of the whorls; the aperture is longitudinal, and often wider in the middle than at each end; the columella is destitute of teeth, and the outer lip is thickened and rolled inwards, being sometimes smooth, and sometimes denticulated; in one or two instances, however, the lip is thin and sharp.

* De Montford seems to have fairly exhausted his encyclopedia of nomenclature by the time he brought his multigeneric notions to a conclusion. His genus *Ultimus* was so called because it happened to be the *last* in the book.

Examples.

Pl. CCXC. Fig. 1.

Ovula volva, Lamarck, Anim. sans vert., vol. vii. p. 370. Encyclopédie Méthodique, pl. 357. f. 3. Sowerby, Species Conchyliorum, Part I. f. 56 and 57.

Bulla volva, Linnæus.

Radius volva, De Montford.

Pl. CCXC. Fig. 2 and 3.

Ovula verrucosa, Lamarck, Anim. sans vert., vol. vii. p. 367. Encyclopédie Méthodique, pl. 357. f. 5. *a*, *b*. Sowerby, Species Conchyliorum, Part I. f. 10 and 11.

Bulla verrucosa, Linnæus.

Calpurnus verrucosus, De Montford.

Pl. CCXC. Fig. 4.

Ovula gibbosa, Lamarck, Anim. sans vert., vol. vii. p. 369. Encyclopédie Méthodique, pl. 357. f. 4. *a*, *b*. Sowerby, Species Conchyliorum, Part I. f. 28 to 31.

Bulla gibbosa, Linnæus.

Ultimus gibbosus, De Montford.

Pl. CCXC. Fig. 5.

Ovula birostris, Lamarck, Anim. sans vert., vol. vii. p. 370. Encyclopédie Méthodique, pl. 357. f. 1. *a*, *b*. Sowerby, Species Conchyliorum, Part I. f. 44 and 45.

Bulla birostris, Linnæus.

TEREBELLUM, Klein.

Testa elongata, subcylindrica, leviter convoluta, ad basem emarginata, spirâ prominulâ, apice subobtuso; aperturâ longitudinali, supernè

Fig. 1. Ovula Volva.
2. 3. ..... verrucosa.
4. ... ..gibbosa.
5. .. birostris

1. & 2. *Terebellum subulatum.*
3. ..... *fusiforme.*
4. ..... *convolutum.*

angustiore; columellâ subrectâ, truncatâ, in mucronem desinente; labro tenui, acuto, versus basem expansiore, subitò decurtato.

The genus Terebellum, proposed by Klein, is one of the few introduced by that naturalist which have been appreciated by modern writers. Linnæus, however, included the only recent species referred to it in his genus *Bulla*; the Professor of Upsal paid little regard to the labours of his contemporaries; he was so intent upon the vastness of his own scheme, that in his anxiety to embrace the whole three kingdoms of nature many little advantages were lost that would have done honour to his 'Systema.' Lamarck appears to have been the first to revive the genus in question, and the only controversy that exists at present is in regard to the situation that it should occupy in the system, De Blainville and some others contending that the Terebella have a strong affinity with the *Strombi*. For our own part, we have followed the arrangement of Lamarck for want of knowing a better, and we believe that until some allied species are discovered, the situation of this genus will be a source of much embarrassment.

The shell of Terebellum may be described as being elongated, somewhat cylindrical, but slightly convoluted, and emarginated at the base, the spire being prominent, and rather obtuse at the apex; the aperture is longitudinal, and narrowed towards the upper part; the columella is nearly straight, truncated, and ends in a point; and the outer lip is thin, sharp, expanded, and suddenly shortened off at the base.

Examples.

Pl. CCXCI. Fig. 1 and 2.

Terebellum subulatum, Lamarck, Anim. sans vert., vol. vii. p. 410. Encyclopédie Méthodique, pl. 360. f. 1. *a*, *b*, *c*. Martini, Conch., vol. ii. pl. 51. f. 568 and 569.

Strombus terebellum, Rumphius.

Terebellum pullum, Klein.

Terebra alata, D'Argenville.

Conus terebellum, } Linnæus.
Bulla terebellum, }
Avena marina, Martini.
Fig. 2. *Terebellum punctatum*, Klein. Chemnitz.

Pl. CCXCI. Fig. 3. (fossil).

TEREBELLUM FUSIFORME, Lamarck, Anim. sans vert., vol. vii. p. 411.

Pl. CCXCI. Fig. 4. (fossil).

TEREBELLUM CONVOLUTUM, Lamarck, Anim. sans vert., vol. vii. p. 411. Encyclopédie Méthodique, pl. 360. f. 2. *a*, *b*.

Bulla sopita, } Brander.
—— *volutata*, }
Seraphs convolutus, De Montford.

CONUS, Linnæus.

Testa conica, ad basem leviter emarginata, anfractibus confertim volutis, non descendentibus; spirâ variâ, apice obtuso, nonnunquam subacuto; aperturâ longitudinali, plerumque angustâ; columellâ rectâ, labro simplici, tenui, acuto, supernè emarginato. Operculum corneum, minutum.

The word Conus, or one of somewhat analogous interpretation, has been attached in all ages to those interesting and popular shells which we have now to treat of; Linnæus, however, as the chief promulgator of systematic nomenclature, may fairly be regarded as the founder of the genus. The shells that are associated in this division exhibit a vivid and pleasing variation of colour, and their simple and unvarying structure renders them familiar and easy to distinguish. Although the genus Conus has increased in number and variety of species since the publication of the 'Systema Naturæ' in as full and rapid proportion as other genera of

Plate CCXCII.

Conus

mollusks, it has never been thought susceptible of being dismembered. An attempt was certainly made by De Montford to establish three new genera from it, *Rollus*, *Cylinder* and *Hermes*, but in no case have they been followed, except in the plan laid out for the arrangement of our national collection.

The situation of this genus in the general system, like that of the preceding, is still open to controversy. De Blainville places it immediately after *Strombus* on account of the resemblance in the formation of the shells of that genus in an early stage of growth; Deshayes includes it in his family of *Buccinidæ*; and Gray, on the other hand, refers it to his family of *Muricidæ* after *Pleurotoma*. For our own part, we have followed Lamarck, rather against our inclination; for upon comparing certain species of Coni with the *Pleurotoma mitræformis** we discover a resemblance, which is increased by their being operculated.

The shell of Conus may be described as being conical, and emarginated at the base, with the whorls closely rolled upon their axis, and not descending; the spire varies considerably, being sometimes acuminated, sometimes totally depressed; it is, however, generally rather obtuse at the apex; the aperture is longitudinal, and rather narrow; the columella is straight, and the outer lip is thin, acute, and emarginated at the upper part. The operculum is horny and minute.

Examples.

Pl. CCXCII. Fig. 103.

Conus centurio, Born. Mus., pl. 7. f. 10. Lamarck, Anim. sans vert., vol. vii. p. 466. Martini, Conch., vol. ii. pl. 59. f. 655.
Vigiliarum præfectus, Martini.
Conus tribunus, Gmelin.

* However we may have had occasion to differ from Mr. Gray in regard to the generic distribution of the Mollusca, we admit the superiority of his views in this instance, and can only regret having omitted to follow a good example. It seems pretty well agreed amongst authors that the Cones are not strictly referable to the family of the Convoluta, though no two authors have yet agreed upon the exact situation they should be referred to.

Pl. CCXCII. Fig. 104.

CONUS SUMATRENSIS, Hwass. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 655. pl. 327. f. 8. Lamarck, Anim. sans vert., vol. vii. p. 472.

Conus princeps Sumatræ, Chemnitz.

Pl. CCXCII. Fig. 105.

CONUS BARBADENSIS, Hwass. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 632. pl. 322. f. 8. Lamarck, Anim. sans vert, vol. vii. p. 458.

Pl. CCXCII. Fig. 106.

CONUS COLUBRINUS, Lamarck, Anim. sans vert., vol. vii. p. 517.

Pl. CCXCIII. Fig. 115.

CONUS OMAICUS, Hwass. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 714. pl. 339. f. 3. Chemnitz, Conch., vol. x. pl. 143. f. 1331. No. 2. Lamarck, Anim. sans vert., vol. vii. p. 504.

Volute d'Oma ou de St. Thomas, D'Argenville.

Thalassiarchus Insulæ S. Oma, Martini.

Conus S. Thomæ, Chemnitz.

Pl. CCXCIII. Fig. 116 and 117.

CONUS NOBILIS, Linnæus (Gmelin), Syst. Nat., p. 3381. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 715. pl. 339. f. 7 and 8. Lamarck, Anim. sans vert., vol. vii. p. 504.

Pardus flavus, D'Argenville.

Uxor venusta,
Tigris lutea,
Maritus formosus,
Alveolus lusorius, } Chemnitz.

Plate CCXCIII.

Plate CCXCIV.

131

132

129

136

130

Pl. CCXCIII. Fig. 118 and 119.

Conus monile, Hwass. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 646. Lamarck, Anim. sans vert., vol. vii. p. 466. Chemnitz, Conch., vol. x. pl. 140. f. 1301 to 1303.
Capitaneus generalis, Chemnitz.

Pl. CCXCIV. Fig. 129.

Conus imperialis, Linnæus (Gmelin), Syst. Nat., p. 3374. Lamarck, Anim. sans vert., vol. vii. p. 445. Encyclopédie Méthodique, pl. 319. f. 1.
Corona imperialis, Martini.

Pl. CCXCIV. Fig. 130 and 131.

Conus fuscatus, Born. Mus., p. 129. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 616. pl. 319. f. 4. Lamarck, Anim. sans vert., vol. vii. p. 446.

Pl. CCXCIV. Fig. 132.

Conus viridulus, Lamarck, Anim. sans vert., vol. vii. p. 446. Chemnitz, Conch., vol. x. pl. 139. f. 1289.
Conus imperialis, var., Chemnitz.
Conus fuscatus, var., Bruguière.

Pl. CCXCIV. Fig. 136.

Conus mustelinus, Hwass. Bruguière, Encyclopédie Méthodique, vers, vol. i. part ii. p. 654. pl. 327. f. 6.
Conus capitaneus, var., Chemnitz.

Class IV. PTEROPODA.

Animal pelagium, subgelatinosum, parte corporis abdominali testâ inclusum ; capite indistincto, tentaculis duobus instructo, at interdum nullo ; pallio amplo, tenuissimo, ad utrumque latus affixo ; ore subterminali, alis membranaceis, natatoreis, duabus, utrinque munito. Branchiæ pectinatæ, per aquam tantùm respirantes, intro corpore celatæ.

Testa parva, aut vitrea, aut gelatinoso-cartilaginea, vel globosa, vel trigona, vel cylindrica, partem corporis abdominalem obtegens.

By referring to our observations on the preceding class of conchiferous mollusks, the *Mollusca Gasteropoda*, it will be seen how much indebted we have been to the great author of the 'Règne Animal' for his very natural and convenient method of arranging them. Our obligation to that naturalist is, however, further enhanced by his lucid investigation of the pteropodous or wing-footed mollusks. Before his time the existence of these prolific little animals was comparatively unknown ; Cuvier was indeed the first to treat of them with any degree of scientific accuracy ; observations were added by De Blainville, involving much important information ; a good practical history of their habits and geographical distribution has been contributed by D'Orbigny ; and we believe that M. Souleyet, a skilful demonstrator at Paris, is at this moment vigorously occupied upon the comparative anatomy of the species.

The Pteropoda constitute a series of small but well-organized mollusks, inhabiting the great body of the ocean ; they are said to dwell in swarms at different depths, and exist in greater or less abundance in all pelagic waters. Like the *Carinariæ* they generally swim in numbers

together, and it has been observed that they rarely make their appearance in the daytime, or in stormy weather.

In regarding their distinctive features of organization, the Pteropoda are clearly intermediate between the *Gasteropoda* and the *Cephalopoda*; the foot or gastropodal disc of the former, being modified into a kind of pteropodal natatory fin, offers an intermedial transition as it were to the locomotive tentacula of the latter. They are of soft and somewhat gelatinous structure, and have the abdominal portion of the body inclosed within a glassy shell; there is a rather indistinct head, almost or altogether destitute of eyes, and a mantle which is large, thin, and capable of great dilatation and contraction. The mouth is subterminal, and it is provided on each side with one or more membranaceous wing-like natatory fins. The breathing organs are pectinated, and internal, like those of the Gastropods; but in some species they are so exceedingly minute, as to be only just discernible under a strong magnifying power.

The conchiferous Pteropods (for they are not all conchiferous) have sometimes a globose, sometimes a cylindrical shell, and it is for the most part either partially or altogether enveloped by the mantle; in some cases the shell, however, becomes modified into a kind of gelatinous cartilaginous integument.

The rank as well as the situation which we have assigned to these mollusks in the natural system, is that latterly adopted by Cuvier; Gray pursues the same method of arrangement, but not, however, Lamarck or De Blainville*. They were placed by the learned author of the 'Histoire des Animaux sans Vertèbres' between the Brachiopods and the Gastropods, under an impression that the wing-like pair of natatory fins is merely a modification of the bilobed mantle of his 'Conchifères,' and the shell of *Hyalæa* a modification of the shell of *Terebratula*. Here,

* De Blainville's crude notion of the *Argonaut* appears to have somewhat influenced his methodical distribution of the Pteropods. The genera *Argonauta* and *Spiratella* are associated together in his 'Manuel de Malacologie' under the title of "*Les Pteropodes*," whilst the rest of this class are placed after the *Bullæ*, *Aplysiæ*, &c., in another and separate family, under that of "*Les Aporobranches*."

however, our great conchologist was in error; the Pteropods are not only furnished with a distinct mantle, independent of the natatory fins, but the parts between which he drew this comparison are not even analogous organs, the one being destined to perform the office of locomotion, the other of calcification. The calcifying property of the mantle is but feebly developed in the Pteropoda, the shell, like that of the *Carinariæ*, seldom exceeding the common tenuity of fine glass; their power of locomotion must, however, be excessive. D'Orbigny, who often passed the night in contemplating the myriads of these mollusks that are then seen floating on the sea, observes that they begin to appear about twilight, and that certain species come to the surface with the utmost regularity at certain hours of the night; he considers that they inhabit particular zones, as it were, at different depths of the ocean, and that they occupy as many different periods of time in making their progress to the surface. On calm nights, especially in the tropical regions, the surface of the ocean is quite darkened with swarms of these prolific animals, and they invariably disappear by the return of day-break. The depth of their descent is said to be governed in some way by the intensity of light upon the surface of the water*; we look upon this theory, however, as postulate rather than proof, for their power of vision is described by zootomists as being either indistinct or altogether wanting.

The Pteropoda are separated into two families by De Blainville, *Gymnosomata* and *Thecosomata*, naked and conchiferous; as, however, we treat only of the latter, we divide them at once into six genera, as follows:

Hyalæa.	Creseis.
Cleodora.	Cuvieria.
Spiratella.	Cymbulia.

* Spirits of twilight, whose flight is measured by the opacity of their element.

Pteropoda.

Fig 1. Hyalea tridentata.
2. Cleodora cuspidata.
3. Limacina helicoides
4. Cresis spinifera
5. Vaginula Daulinii
6. Cuvieria columnella.

HYALÆA, Lamarck.

Testa globosa, infernè rubro-ferruginosa, supernè pallidior; anticè inflata, subrostrata, posticè plana, tridentata, dente centrali validissimo, apice pervio; aperturâ lineari, utrinque extensâ.

The shell of the Hyalæa was confounded by the author of the 'Systema Naturæ' with the *Terebratulæ* in his genus *Anomia*, and it appears to have been some time before naturalists were at all aware of the nature of its animal inhabitant. Bruguière, evidently incredulous of their affinity with the *Terebratulæ*, seems to have omitted any mention of the shell in question; he judged, advisedly no doubt, that it was not of bivalve structure. Lamarck introduced the genus Hyalæa for the sake of distinguishing this seemingly anomalous production, but he skilfully laboured to the last to prove it to be a modification of the shell of *Terebratula*. The investigations of Cuvier, De Blainville, Rang and others, have, however, fully determined its separate and distinct nature; and when the univalve structure of this shell is considered, coupled with the fact of its never being found attached to any marine substance, we almost wonder that its real character should have so long eluded the ingenuity of their predecessors.

The habits of these singular mollusks have been already noticed in our observations on the *Pteropoda* generally; it, therefore, only remains for us to describe the shell of Hyalæa as being of a globose form, reddish-brown on the undermost part, and of a paler colour on the uppermost; the anterior portion of the shell is inflated, and somewhat curved or beaked, and the posterior portion is flattish and tridentated, the centre tooth being the strongest, and open at the end; the aperture is linear, and extends from side to side.

Examples.

Pl. CCXCV. Fig. 1.

HYALÆA TRIDENTATA, Lamarck, Anim. sans vert., new edit., vol. vii.

p. 415. Chemnitz, Conch., vol. viii. p. 65. Vignette 13. f. F. G. De Blainville, Manuel de Malacologie, pl. 46. f. 2.

Anomia tridentata, Forskael. Gmelin.

Carolina natans, Abildgaard.

Hyalæa cornea, De Roissy.

Hyalæa Chemnitziana, Peron and Lesueur.

Hyalæa papilionacea, Bory de St. Vincent.

Hyalæa Forskalii, D'Orbigny.

CLEODORA, Peron and Lesueur.

Testa alba, diaphana, triangularis, depressa, quoquoversum stillicidiata, anticè recurvata, posticè tricuspidata, lateribus lanceolatis, sulcatis; aperturâ triangulari, ad lateres coarctatâ.

The Cleodoræ only differ from the *Hyalææ* in the form of their shells; they are triangular, and more acuminated at the sides; and are thinner, and consequently much more brittle and transparent. Peron and Lesueur were the first to distinguish them as a separate genus, and Rang followed the same method of arrangement; D'Orbigny, however, includes them with the *Hyalææ*, and we almost incline to think that they have been separated from them without occasion.

The shell of Cleodora may be described as being white, diaphanous, triangular, depressed, and sulcated or slightly guttered, as it were: the anterior portion of the shell is recurved or beaked, and the posterior is extended into three points, the sides being lanceolated and slightly grooved; the aperture is triangular, and somewhat contracted at each extremity.

Example.

Pl. CCXCV. Fig. 2.

Cleodora cuspidata, Quoy and Gaimard, Voyage de l'Astrolabe, Mollusques, pl. 27. f. 1 to 5.

Hyalæa cuspidata, Lamarck. D'Orbigny.
Cleodora Lessoni, Rang.

LIMACINA, Cuvier.

Testa hyalina, spiralis, obliquè discoidea, lateribus umbilicatis; dorsim carinata, carinâ membranaceâ, lamellari; aperturâ amplâ, integrâ, utrinque paululùm inflatâ.

The Pteropoda, though agreeing very closely with each other in their general organization and habits, appear to be provided with very anomalous kinds of shells; they vary, indeed, so materially in their manner of growth and complete structure, that we should have supposed them to belong to animals differing considerably from each other in their anatomical peculiarities. The little glass shell, of which we are now to treat, described by Cuvier under the generic title of Limacina, is of complete nautiloid structure, and, like the shell of the *Argonaut*, is entirely destitute of any internal partition. De Blainville, struck with the great similarity of formation that exists between these shells, has gone so far as to pronounce the shell of the *Argonaut* to belong to some huge Pteropod; for in his 'Manuel de Malacologie,' p. 494, the *Argonaut*, the Limacina under the title of *Spiratella**, and a variety of it under that of *Atlanta*, are associated together in a particular family by themselves. The little that is at present known of the Limacinæ is not sufficient even to modify the arrangement of Cuvier, but our recent discoveries respecting the *Argonaut* have fully determined its cephalopodous and distinct nature.

The shell of Limacina may be described as being hyaline, spiral, obliquely discoid, umbilicated on each side, and carinated round the back with a membranaceous lamellar keel; the aperture is large and entire, and it is slightly inflated on each side.

* The title of *Spiratella* was introduced by De Blainville on account of the resemblance of the word *Limacina* to *Limacinea*, a name already used in reference to a family of land mollusks.

Example.

Pl. CCXCV. Fig. 3.

LIMACINA HELICIALIS, Sowerby, Genera of Shells, No. 39.
Clio helicina, Gmelin.
Argonauta Arctica, Fabricius.
Spiratella limacina? De Blainville.

CRESEIS, Rang.

Testa conica, elongata, recta, diaphana, rosea, posticè acuminata; anticè aperta, parte dorsali longiori, sulco semitorto per totam longitudinem decurrente.

The genus Creseis, founded by Rang, includes certain others of the Pteropoda distinguished only by the conical formation of their shell; they are said, indeed, to resemble the *Hyalæa* so closely in other respects, that D'Orbigny refers them to that genus. Some authors have referred them to the genus *Cleodora*; and Quoy and Gaimard, it will be seen on reference to our synonyms, have assigned them at different times to both.

The shell of Creseis may be described as being conical, elongated, straight, diaphanous, and of a pale rose-colour; posteriorly it is sharp and acuminated; anteriorly it is open; and the dorsal side of the shell is longer, more pointed, and has a somewhat twisted groove running throughout its entire length.

Example.

Pl. CCXCV. Fig. 4.

CRESEIS SPINIFERA, Rang, Annales des Sciences Naturelles, vol. xiii. pl. 17. f. 1. Quoy and Gaimard, Voyage de l'Astrolabe, pl. 27. f. 15 and 16.
Hyalæa subula, D'Orbigny.
Cleodora subula? Quoy and Gaimard (Ann. des Sci.).
Cleodora spinifera, Deshayes.

CUVIERIA, Rang.

Testa tenuissima, alba, aut cylindrica, aut globulosa, aut hemispherica; posticè rotundata, obtusa, truncata; anticè depressa, pervia, aperturâ transversali, parùm obliquâ.

Three other genera were proposed by Rang in his 'Manuel de Conchyliologie' for the subdivision of the Pteropods: Cuvieria for such as have a cylindrical shell; *Psyche* for those in which it is globular; and *Eurybia* for those whose shells assume a hemispherical form. These three variations of form approximate, however, so closely, and run so completely into each other, that we do not hesitate to unite them under the first of these titles.

The shell of Cuvieria may be described then as being very thin, white, and either cylindrical, globular, or hemispherical; the posterior end is rounded, obtuse, and truncated; the anterior depressed, and open, the aperture being transverse, and slightly oblique.

Example.

Pl. CCXCV. Fig. 6.

Cuvieria columnella, Rang, Manuel de Conchyliologie, pl. 2. f. 4. D'Orbigny, Voyage dans l'Amérique Méridionale, Mollusques, pl. 8. f. 35 to 39.

Cleodora columnella, Deshayes.

CYMBULIA, Péron.

Testa gelatinoso-cartilaginea, crystallina, oblonga, calceoliformis; posticè truncata; anticè pervia, aperturâ sublaterali.

This Pteropod was discovered by Péron, and differs essentially from

any other of the class; it is larger and of more intricate structure, and the shell is partially modified into a kind of gelatinous, crystalline integument. The species represented in our plate was the only one known to Lamarck; there have, however, been three or four discovered since his time by MM. Quoy and Gaimard, and described and figured by those assiduous malacologists in the "Zoology" of their 'Voyage de l'Astrolabe.'

The shell of Cymbulia, or more properly its integument, may be described as being cartilaginous, crystalline, and of an oblong, slipper-like shape, truncated posteriorly and open anteriorly, the aperture being nearly lateral.

Example.

Pl. CCXCVI. Fig. 1 to 3.

Cymbulia Peronii, Cuvier, Règne Animal, vol. ii. p. 380. Péron, Annales du Muséum, pl. 3. f. 10 to 12.

Class V. CEPHALOPODA.

Animal corporis parte abdominali pallio amplo, sacciformi, circumtectâ, testâ munitum; anticè capitatum, capite distincto, oculis duobus prominulis instructo, brachiis, quasi tentaculis, flexilibus agillimis, plus minusve elongatis coronato; ore terminali, maxillis duabus corneis armato. Branchiæ aut duæ aut quatuor, subfoliiformes, intra pallium celatæ.

Testa loculosa vel illoculosa.

The Cephalopoda, or Head-walking mollusks, so called from their manner of crawling on their tentacles with the head downwards, are the most highly organized of the grand invertebrate moiety of the Animal Kingdom, and come next in order, therefore, to the Fishes, the most simply organized of the vertebrate portion. They present a system of organiza-

Plate CCXCVI.

Fig 7. Cymbulia Peronii

tion intermediate between the Gastropods and the Fishes, inasmuch as, like the former, they are soft inarticulated masses, and in some instances conchiferous; whilst they have, like the latter, a well-developed head, enclosing a semi-cartilaginous skull, a pair of jaws, fins, a tongue, &c., with moreover a keen sense of vision and great power of locomotion. They do not, however, present that immediate relation, that nicely adjusted affinity with the proximate classes, which is so prominent in most parts of the system. Some authors have been tempted to conjecture that there is a link of animal creation between the Cephalopods and the Fishes which yet remains to be discovered. Lamarck, the great demonstrator of the Invertebrates, says, that they are probably not the last of that series; and the rather forced affinity which Mr. Owen exhibits between the Nautilus and the Gastropods proves, on the other hand, that the Cephalopods are indeed an isolated group. The Pteropods, which present a more simple state of organism than the Gastropods, are nevertheless allied to the class of animals under consideration: the abdominal portion of their body is enveloped, like that of the Cephalopods, with a sack-like mantle, though in a greatly modified degree; and their nocturnal habits, their pelagic nature, and the rapidity with which they swim, seem evidently to prepare us for the corresponding characters which are so highly indicated here.

We find mention of these extraordinary animals in the earliest records of natural history; they were minutely described by Aristotle, and have been the theme of naturalists and poets in every subsequent age. Little was, however, known of the real nature of the conchiferous portion of them until long after the revival of letters; the shells were never found with their inhabitants, and the relation between them was not established with any degree of certainty until the discovery of the living Nautilus by Rumphius. This was, indeed, an important era in the history of the Cephalopoda; for no one could have imagined that the Nautilus, together with the lost race of Ammonites, were in immediate relation with the hideous Cuttle Fish and Calamary. The nature of those polythalamous tenants of a former world, the Ammonites and their multifarious congeners, was demonstrated by the discovery of the *Nautilus*, a solitary

living remnant, which has proved that the vast assemblage of organic remains abounding in our secondary formations must have belonged to animals who once dwelt in full activity and vigour at the bottom of the ocean, constructing a discoidal shell by force of gravity, and hermetically sealing the vacated portion as they increased in bulk, to give them buoyancy under the surrounding pressure.

The body of the Cephalopodous mollusks presents exactly the appearance of an ovate or oblong bag; the viscera, or abdominal portion of the animal, being contained in a strong muscular bag-like mantle; and it is often furnished either posteriorly or laterally with a pair of fin-like processes to assist locomotion. The head, which is situated at the opening of this bag, is provided with a vivid pair of eyes, as also with a strong pair of horny mandibles like the beak of a parrot, and it is crowned with a number of long active tentacles, which, being armed with suckers, perform the several offices of crawling, swimming, and preying. The suckers possessing a strong power of attachment, are either sessile or pedunculated, and in the latter case assume the terrific character of claws. The respiratory functions are performed either by two or four somewhat foliated branchiæ; the water is inhaled at the pallial aperture, and passes out by the excretory funnel or vent-tube, which protrudes from the front of the neck. The sexes are separate, and the females, which are considerably the more abundant as far as can at present be ascertained, deposit an enormous quantity of eggs. They are all provided with a capacious ovary at the posterior extremity of the mantle; some discharge their eggs in strings upon the rocks, whilst others construct a light, papyraceous shell, for protecting them when impregnated.

Very few of the Cephalopods are conchiferous; and in only one of these instances, in *Nautilus*, does the shell appear designed for the complete envelope of its inhabitant. The light papyraceous shell of the *Argonaut* seems merely a sexual provision in the female for the preservation of her eggs; it is modelled on a different type from that of other mollusks, being secreted from the outside by two of the tentacles, which possess a feeble power of calcification. Many of the naked Cephalopods have a kind of cartilaginous plate, the analogue of a shell, inserted within the

dorsal part of the body, and in some it assumes a lanceolate, transparent structure like a glass feather. In *Spirula* the shell is inserted within the posterior extremity of the abdominal sack, and may probably be destined to have a certain hydrostatic influence on the movements of its owner. Nothing, however, is known of this animal beyond the record of a single individual, and although the discoveries of M. Péron have been quoted with considerable assurance by continental writers, they yet remain to be confirmed. A very extensive group of minute chambered bodies has also been attributed to animals of similar nature to the Cephalopods, on account of their cellular construction, though presenting a singular anomaly of disposition.

Gualtieri was the first to include the *Foraminifera* in this class, and upon the discovery of the living *Spirula*, by Péron and Lesueur, Lamarck and others immediately convinced themselves that he was right. They felt persuaded that these minute cellular bodies were the shells of animals similarly circumstanced. "*Ce fut donc rendre un service bien important à la science,*" says Lamarck, "*je me crus autorisé à le regarder comme le type des animaux qui produisent les Coquilles multiloculares, et enfin à conclure que toutes ces Coquilles appartiennent à des Cephalopodes*;" and Deshayes, no doubt encouraged in this belief by the ingenious examination of them by D'Orbigny, says, "*C'est sans contredit l'un des faits les plus importans dont la science se soit enrichie, que celui rélatif à la Spirule; les doutes que l'on pouvoit conserver, sur la nature de beaucoup de genres devenoient désormais impossibles.*"

The testimony of these writers is so strong on this head, that we have been fearful to exclude these foraminiferous cells from the class; it is, however, strongly suspected that they are deposited by the *Radiata*, or some other animals of inferior organization*.

The habits of the Cephalopods have been spoken of with much enthusiasm by travellers; no molluscous animals of their size are so abundantly prolific, or so widely distributed over the globe. They mostly inhabit

* Philippi has had less hesitation than ourselves on this point, and perhaps with judgment. "Sic dicta Polythalamia," says that writer in his Introduction to 'The Shells of Sicily,' "hic omisi, quia ea nullo modo Molluscis adscribi posse credo."

the deep waters of the ocean, and, like the nocturnal swimmers of the preceding class, are seldom to be seen excepting at night. They exhibit, like the *Pteropoda*, a great degree of sociability, swimming for the most part in herds, and with great activity of movement; are exceedingly voracious, swallowing fishes, pteropods, and everything that comes in their way; and in their turn are destructively preyed upon by the superior inhabitants of the deep. They are provided, however, with a curious means of defence in this emergency; a contrivance which none but the Great Artificer could have devised. In the interior of the body is a cavity, in which a kind of inky fluid is generated of greater or less intenseness, and the animal has the faculty of discharging it when in a state of alarm, for the purpose of darkening the surrounding water, so as to be enabled to escape the vigilance of pursuers by making off unseen in an oblique or opposite direction. This protective property is naturally more strongly developed in those Cephalopods which are destitute of a calcareous envelope*, and in those which wander defenceless upon the open sea, than in those of more solitary habits, which find refuge in cavities of rocks. The same variety of adaptation is observable too in their locomotive powers; the wandering Cephalopods are furnished with a pair of lateral fins to assist them in their passage through the element, some having the addition of a caudal fin to enable them to swim backwards, whilst others have their tentacles webbed around the base like the foot of a duck, serving not only to increase their power of swimming, but enabling them to dart out of the water, after the manner of the flying-fish. The suckers of these animals have a very formidable character, and assist them greatly in their cruel and voracious habits; sometimes they are pedunculated, assuming the appearance of claws, and the fishermen are greatly afraid of them. The sense of vision is very strong in the Cephalopods; many of them have the power of turning their great eyes completely round like the chameleon, and the skin of these mollusks, as

* The skilful anatomists of the *Nautilus* do not appear to have discovered any reservoir for the inky fluid in that well-protected Cephalopod, or we should have hazarded the conjecture that something of the kind exists, from the black coating which the shell always exhibits upon the involuted convexity of the spire.

in that very remarkable quadruped, will very rapidly change colour; it is covered in most of them with a number of pigmental spots or papillæ, and the variety of fixed hues which they will often exhibit in a comparatively short period of time is remarkable*.

The Cephalopoda should undoubtedly be divided according to the strict variations of the soft parts, the modifications of the branchiæ, the fins, the tentacles, &c.; but as we have only to treat in this place of such as are conchiferous, we must follow the old arrangement of Breynius, adopted always by Lamarck, in which those with chambered shells are separated from those in which the shell is not chambered, after the following manner:

POLYTHALAMIA. MONOTHALAMIA.

Order I. CEPHALOPODA POLYTHALAMIA.

Testa multilocularis, vel interna, vel externa, septis numerosis divisa; septis aut siphunculo, aut foraminibus, perforatis.

The Polythalamia, or many-chambered Cephalopods, are divided into two families, according to the manner in which the chambers into which their shell is divided are perforated; in one group it is by means of a continuous siphon, in the other by an irregular number of simple perforations. The latter division is however inserted here, upon very

* The extreme voracity of these animals is powerfully described by Mr. Owen in speaking of the *Octopus*, a naked Cephalopod and the largest of the class. "Those alone," says that accomplished writer, "who have witnessed the persevering activity, power, and velocity of motion exercised by the *Octopus*, when engaged in its destructive practices amongst a shoal of fishes, and who have seen it with its beak buried in the flesh of a victim held fast in the irresistible embrace of its numerous arms, in an instant simultaneously dissolve the attachment of its thousand suckers, and, disengaging itself from its prey, dart like an arrow from the net that has been cautiously moved towards it for its capture, can form an adequate idea of the acuteness of visual perception and powers of action with which this singular and unshapely Cephalopod is endowed."—Trans. Zool. Soc. vol. ii. part ii. 1838.

insufficient data; the minute cellular bodies which constitute that family are only theoretically regarded as of cephalopodous origin, and we introduce them solely from our inability to disprove it. We shall endeavour to make a succinct exposition of their history, down to the present time, and the reader must then determine for himself whether the notions that are commonly entertained of the nature of these objects can be feasibly supported.

The family of the multilocular Cephalopods is divided into two families, as follows:

FORAMINIFERA. SIPHONOIDEA.

Family 1. FORAMINIFERA.

Testa minutissima, vitrea, loculis numerosis, variè constructis, composita, foraminibus parvulis plus minusve perforatis.

The family of the Foraminifera was introduced by D'Orbigny for the reception of a number of very minute cellular bodies, which are referred to this portion of the animal kingdom upon the supposition that they are formed by certain cephalopodous mollusks; they are found for the most part mingled with the sand on the sea-shore, or attached to sea-weed, shells, &c., and many of them are so diminutive in size as to be scarcely perceptible by the naked eye. These shells, if indeed (in a conchological sense) they be shells at all, consist of a number of separate and distinct chambers, of every imaginable variety of form, deposited or piled as it were one upon another, in all sorts of shapes, so that their plan of deposit is straight, curved, spiral, globular, discoidal, turbinated, nautiloid, trochiform, or, in fact, any other conceivable form. The chambers vary considerably too in size, as well as in the character, which is indicated by the title, namely, that of being more or less pierced with a number of small holes. The few that were known to Linnæus were referred by him to the same part of the system as now, his genus *Nau-*

tilus, on account of their multilocular structure; and Fichtel, De Montford, De Haan, D'Orbigny and Deshayes have successively laboured to prove their affinity with the Cephalopoda in general. The theory that these naturalists have advanced has not yet been proved, although we venture to introduce it. Cuvier, Owen, and a few of not much inferior celebrity, fearful of venturing beyond the limits of anatomical experience, pass over them in comparative silence*; Lamarck seems almost to depend upon the observations of Fichtel; De Blainville treats them with evident incredulity as internal shells; and Gray asserts that they are probably the cells of certain animals allied to the *Polyzoa*, a group of much inferior organization to the Mollusca†. Be this as it

* "M. De Blainville made also another important step in advance, by separating the *Cephalopods* with microscopic chambered shells, under the name of *Cellulacea*, from those with siphonated shells, which he terms *Polythalamacea*; but subsequent researches have since proved that the *Cellulacea* of De Blainville (*Foraminifera* of D'Orbigny) ought to be removed altogether from the class *Cephalopoda*."—Owen, 'Trans. of the Zool. Soc.,' vol. ii. part ii. 1838. Ehrenberg also urges the propriety of their removal.

† "In Cases 7 and 8 are placed a series of models on an enlarged scale, and some specimens of minute bodies. The nature of the animals which form them is not known; and they may belong to several different orders. Some have supposed them to be internal shells; but this cannot be the case with all, as many are attached by their outer surface to sea-weeds and shells. From their being formed of numerous chambers, they have been generally associated with the *Nautili*; but they differ essentially from the latter in their construction, which consists of a number of cells piled one on the other, and in having no terminal cavity for the reception of the body of the animal. The cells are furnished with one or more small mouths, and placed one on another in different directions, some forming straight lines, as *Nodosaria*, and others spiral ones, as *Rotalia*. In others the cells are half the length of a whorl, so that each new cell changes the situation of the mouth from one to the other end of the shell, as in the *Miliolæ*; and in others the cells are divided into numerous longitudinal tubes, as in *Alveolina* and *Fabularia*.

"These animals have been generally arranged with the *Nautili*, and some have classed them with the *Cephalopodous Mollusca*, while others have thought they might be formed by animals allied to the *Annelides*. One author has proposed that they should be formed into a class, which he proposes to call *Rhizopodes*; but it is not improbable, when they shall have been more completely examined, that they will be found to be allied to the *Polyzoa*; and the body, which has been called their shell, may prove to be only a hardened skin, like the cells formed by that class of animals."—Gray, 'Synopsis of the Contents of the British Museum for 1841.'

may, however, we cannot but feel interested in the meritorious exposition which has been made by D'Orbigny after an examination of many hundred species, and have therefore chosen to exhibit his arrangement.

The Foraminifera are divided by D'Orbigny into five sections of fifty-two genera, according to their conceived affinities of structure; and we have selected the typical one of each as sufficient, under existing circumstances, for their methodical distribution.

Orbiculina.	Textularia.
Spiroloculina.	Nodosaria.
Polystomella.	

ORBICULINA, Lamarck.

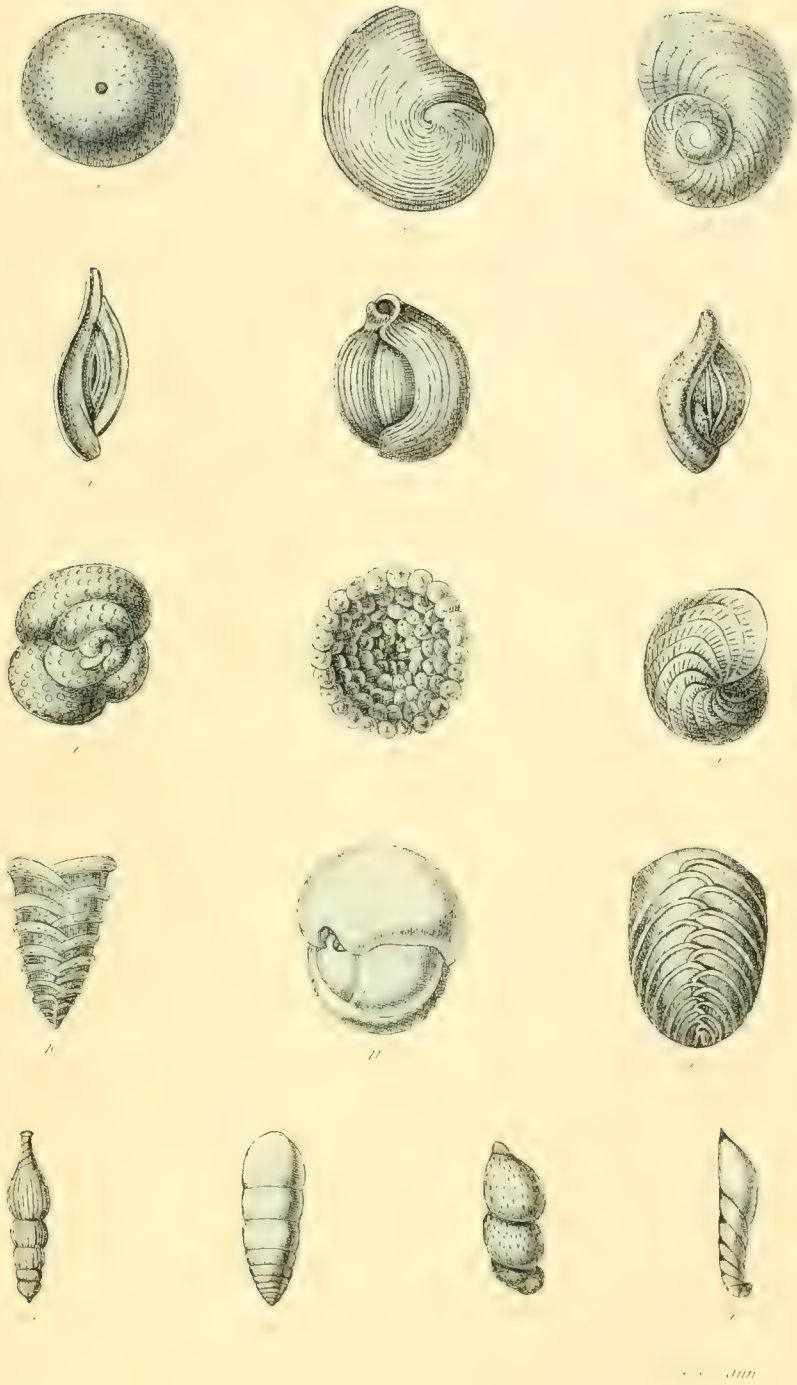
Testa orbicularis, subdiscoidea, spiralis, spirâ excentricâ; loculis in cavitates parvulas divisis; orificio unico, aut perpluribus.

To this genus we propose to refer all the so-called foraminiferous cephalopods that are included by D'Orbigny in his family of *Les Entomostègues*, containing the following five genera: *Amphistegina*, *Heterostegina*, *Orbiculina*, *Alveolina* and *Fabularia*. In the first two of these divisions the shell is characterized as having only a single orifice in it, but in the remainder it is said to exhibit a number of much smaller openings; Deshayes divides them into sections accordingly, but we refrain from entering more minutely into the subdivision of these microscopic bodies until the zoological relation which is assigned to them has been clearly and credibly confirmed.

Examples.

Pl. CCXCVII. Fig. 1.

Orbiculina universa, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 1. f. 1.



Pl. CCXCVII. Fig. 2.

ORBICULINA NUMISMALIS, Lamarck, Anim. sans vert., vol. vii. p. 609. Encyclopédie Méthodique, pl. 468. f. 1. *a*, *b*, *c*, *d*.
Nautilus orbiculus, Fichtel.

Pl. CCXCVII. Fig. 3.

ORBICULA DEPRESSA, *Nobis*. Cuvier, Règne Animal (Fortin's edition), Mollusques, pl. 14. f. 2.
Heterostegina depressa, D'Orbigny.

SPIROLOCULINA, D'Orbigny.

Testa suborbicularis, loculis diametricè accumulatis, orificio dente plus minusve complicato munito.

Our second genus of Foraminifera, Spiroloculina, corresponds with the genus *Miliola* of Lamarck; we follow however the nomenclature of D'Orbigny, and include under this head his six genera, *Biloculina*, *Spiroloculina*, *Triloculina*, *Articulina*, *Quinqueloculina* and *Adelosina*, forming his family of "*Les Agathistègues*," to which Deshayes has since added another genus with the appellation of *Saxicolina*. They are arranged by D'Orbigny, in his account of the Foraminifera of the Canary Islands, in two sections, entitled *Miliolidæ* and *Multiloculidæ*, but Deshayes appears to have left them entire. The chambers of the Spiroloculinæ are described as differing from those of the preceding genus, in being diametrically clustered together, and the orifice is said to be furnished with a more or less complicated tooth; the singular formation of the whorls, opposed to each other over their own axis, is also noticed as being remarkable.

Examples.

Pl. CCXCVII. Fig. 4.

SPIROLOCULINA CYMBIUM, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 3. f. 5 and 6.

Pl. CCXCVII. Fig 5.

SPIROLOCULINA WEBBIANA, *Nobis.*

Triloculina Webbiana, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 3. f. 13 to 15.

Pl. CCXCVII. Fig. 6.

SPIROLOCULINA BERTHELOTIANA, *Nobis.*

Quinqueloculina Berthelotiana, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 3. f. 25 to 27.

POLYSTOMELLA, Lamarck.

Testa discoidea, subturbinata, spirâ sæpissimè regulari, plus minusve prominulâ; anfractibus contiguis, loculis irregulariter divisis.

The Polystomellæ are for the most part distinguished as having a somewhat nautiloid construction, but their infinite variation of form renders it exceedingly difficult to fix a proper generic uniformity of character. The mere structure and formation of these bodies is all that can be at present resorted to as a means of classification; and the very anomalous and extraordinary shapes which they present defy the ingenuity of the most skilful systematists. The family of *Les Helicostègues*, which we include under this genus, is by far the largest which D'Orbigny instituted: he divides it into three sections, and these are again subdivided into no less than twenty-six genera. The first section, *Les Turbinoides*, contains ten genera, as follows: *Clavulina*, *Uviferina*, *Bulimina*, *Valvulina*, *Rosalina*, *Rotalia*, *Calcarina*, *Globigerina*, *Gyroidina* and *Truncatulina*; the second section, *Les Ammonoides*, contains four only: *Planulina*, *Planorbulina*, *Operculina* and *Soldania*; and the last section is divided into twelve genera: *Cassidulina*, *Anomalina**, *Vertebralina*, *Polystomella*, *Den-*

* A most appropriate title, if it has reference to anomaly of structure.

dritina, *Peneroplis*, *Spirolina*, *Robulina*, *Cristellaria*, *Nonionina*, *Nummulina* and *Siderolina* under the title of "*Les Nautiloides.*"

The characters which have been assigned to the Polystomellæ are, that they have a discoidal somewhat turbinated shell, with generally a regular spire, which is more or less prominent, with the whorls contiguous, and the chambers irregularly divided.

The following species are selected, one from each of D'Orbigny's three sectional divisions :

Examples.

Pl. CCXCVII. Fig. 7.

POLYSTOMELLA CANARIENSIS, *Nobis.*

Globigerina Canariensis, D'Orbigny, Mollusques des Iles Canaries, pl. 2. f. 10 to 12.

Pl. CCXCVII. Fig. 8.

POLYSTOMELLA VULGARIS, *Nobis.*

Planorbulina vulgaris, D'Orbigny, Tableau Méthodique des Céphalopodes, p. 114. Foraminifères de Cuba, p. 85. Foraminifères des Iles Canaries, pl. 2. f. 30.

Pl. CCXCVII. Fig. 9.

POLYSTOMELLA COMPLANATA, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 2. f. 35.

TEXTULARIA, Defrance.

Testa plerumque elongata, subconica, loculorum seriebus duabus alternatis subangulatim composita.

The genus Textularia may be regarded as the type of D'Orbigny's family of "*Les Enallostègues,*" and the most suitable therefore for representing the several groups into which that division is subdivided. They are ten, as follows: *Bigenerina*, *Guttulina*, *Textularia*, *Vulvulina*, *Dimor-*

phina, *Polymorphina*, *Virgulina*, *Sphæroidina*, *Gemmulina* and *Sagrina*, and are considered peculiar in having the chambers alternately deposited into separate and distinct series, and furnished each on the inner side with a semilunar aperture.

Examples.

Pl. CCXCVII. Fig. 10.

TEXTULARIA SAGITTULA, D'Orbigny, Tableau Méthodique des Céphalopodes, p. 97. Foraminifères des Iles Canaries, pl. 1. f. 19 to 21.
Polymorphum sagittulum, Soldani.

Pl. CCXCVII. Fig. 11.

TEXTULARIA BULLOIDES, *Nobis*.
Sphæroidina bulloides, D'Orbigny, Tableau Méthodique des Céphalopodes. Cuvier, Règne Animal (Fortin's edition), Mollusques, pl. 15. f. 9.

Pl. CCXCVII. Fig. 12.

TEXTULARIA CAPREOLUS, *Nobis*.
Vulvulina capreolus, D'Orbigny, Tableau Méthodique des Céphalopodes. Cuvier, Règne Animal (Fortin's edition), pl. 14. f. 11.

NODOSARIA, Lamarck.

Testa elongata, non spiralis, vel recta, vel arcuata, loculis aut convexis, aut depressis, singulatim superpositis.

The genus Nodosaria, which we have selected to represent the remaining family of D'Orbigny's Foraminifera, "*Les Sticostègues*," includes some of the largest of the series; their shells are either straight or curved, without any indication to become spiral, and consist of a greater or less number of chambers, piled one upon another upon the same axis. Several of them were known to Linnæus; his *Nautili raphanus*, *fascia*, *raphanistrum*, *obliquus*, *legumen*, *radicula* and *siphunculus*, were all referable to

this single division; they no doubt attracted his attention from their superiority of size, though still excessively diminutive, and were referred to the genus Nautilus on account of their multilocular construction. The following are the genera into which this group is divided by D'Orbigny: *Nodosaria*, *Lingulina*, *Frondicularia*, *Rimulina*, *Vaginulina*, *Marginulina*, *Planularia* and *Pavonina*; and the first of these is again subdivided into *Nodosaria* (including *Orthocera* of Lamarck), *Glandulina*, *Dentalina*, *Orthocerina* and *Mucronina*. The whole of the Foraminifera, indeed, exhibit such extreme variations of structure, that they may be verily divided *ad infinitum**.

Examples.

Pl. CCXCVII. Fig. 13.

NODOSARIA STRIATI-COLLIS, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 1. f. 2 to 4.

Pl. CCXCVII. Fig. 14.

NODOSARIA CARINATA, *Nobis*.

Lingulina carinata, D'Orbigny, Tableau Méthodique des Céphalopodes, p. 91; Foraminifères de Cuba, p. 20; des Iles Canaries, pl. 1. f. 5 and 6.

Orthoceratia zoophitica subcordiforma, Soldani.

Pl. CCXCVII. Fig. 15.

NODOSARIA BERTHELOTIANA, *Nobis*.

Marginulina Berthelotiana, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 1. f. 14 and 15.

* Our observations on these heterogeneous creations are gleaned entirely from the elaborate memoirs of De Haan, D'Orbigny and Deshayes. Being somewhat incredulous of the zoological affinity which these writers assign to them, and neither dexterous in theory nor skilful in micrography, we have disposed of them somewhat summarily. Our drawings are taken from the plaster models so ingeniously constructed by D'Orbigny, upon a highly magnified scale.

Pl. CCXCVII. Fig. 16.

NODOSARIA WEBBIANA, *Nobis.*

Marginulina Webbiana, D'Orbigny, Mollusques des Iles Canaries, Foraminifères, pl. 1. f. 7 to 11.

Family 2. SIPHONOIDEA.

Testa loculis regularibus, siphunculo continuo percurrente.

The family of the Siphonoidea, "*Les Siphonoides*" of De Haan, "*Les Siphonifères*" of D'Orbigny, includes two genera of multilocular Cephalopods, which have been associated together on account of the presence of a continuous siphon running from chamber to chamber through the entire convolution of the shell. In one genus, *Spirula*, it passes down the ventral side of the shell, but in the other, *Nautilus*, it perforates the centre. The immediate purpose of this siphon has not yet been satisfactorily determined; we think, however, that in the former it may be intended for some hydrostatic purpose, in the latter it may be destined solely for the passage of the membrane which sustains the animal in its shell during their rotatory operation of growth.

We are now fully acquainted with the organization and habits of the *Nautilus*, but our information is extremely limited with regard to the *Spirula*; the description which has been handed down to us rests indeed upon the testimony of a single individual, and it is only on account of this obscurity in its history that we retain what might otherwise have been considered a very unscientific mode of arrangement; for in one genus the shell is said to be internal, whilst in the other it is external. The following are the genera alluded to:

SPIRULA. NAUTILUS.

SPIRULA, Lamarck.

Testa ut plurimum interna, alba, subpellucida, tubulosa, in spiram discoideam, anfractibus disjunctis, convoluta; septis transversis, intùs convexis, regulariter divisa; siphunculo continuo, propè ad ventralem partem percurrente; aperturâ integrâ, marginibus simplicibus, acutis.

The interesting little discoid shell which Lamarck distinguished with the generic title of Spirula, was described by Lister, Linnæus and others, on account of its multilocular construction, as a species of *Nautilus*; by those however, who, like D'Argenville and Martini, did not observe a binominous formula of nomenclature, it was introduced under the common appellation of the *Cornu Ammonis*. All naturalists seem to have agreed upon its immediate relation to the *Nautilus*, and when the soft parts of this mollusk were discovered by Péron and Lesueur, their conclusions were singularly confirmed; for it was found to be a decapodous cephalopod, inhabiting the deeper waters of the ocean. But however strikingly these mollusks may resemble each other in their habits and general organism, they differ materially in regard to the office and position of their shell. In the *Nautilus* it is external and protective, the soft parts being lodged within the porch or aperture of the shell; but in the Spirula the shell is internal. The body of this cephalopod is not unlike that of the cuttle-fish; the sack-like mantle is divided at the lower extremity into two equal lobes, and the shell lies concealed between them, having its attachment strengthened by the accession of a tendinous filament penetrating the siphon.

The discovery of the Spirula in a living state was hailed with especial enthusiasm by many, because it was reckoned to assist the ingenious supposition that the *Foraminifera* might be the analogical appendages of animals of similar organization; the cephalopodic nature of these bodies, however, still remains to be determined. The natural history of the

Spirula even is founded upon the single testimony of Péron and Lesueur, and no other specimen than the one which they described having as yet been seen, it cannot but be considered to be involved in some uncertainty; one French traveller, indeed, Fréminville, has challenged the authenticity of their description.

The shell of Spirula may be described as being for the most part internal, white, transparent and tubular, rolled into a discoid spire, with the whorls entirely separated from each other; it is then regularly divided or partitioned by a number of transverse septa, which are convex on the inner side, and there is a continuous siphon running throughout from chamber to chamber, near the ventral part of the shell; the aperture has been always found entire, with the margins simple and acute, but we are not yet satisfied that this is the mature completion of the shell.

Example.

Pl. CCXCVIII. Fig. 1 to 3.

Spirula Peronii, Lamarck, Anim. sans vert., vol. vii. p. 601. Martini, Conch., vol. i. pl. 254. Vignette 11. f. 1 to 3; De Blainville, Anatomie de la Coquille de la Spirule, Nouvelles Annales du Muséum, vol. iii. p. 18. pl. 1. f. A. to F.

Spirula australis, Encyclopédie Méthodique.

Cornu Ammonis, D'Argenville, Martini.

NAUTILUS, Aristotle.

Testa orbicularis, symmetrica, anfractibus plurimis, in spiram discoideam contiguè volutis, ultimo alios obtegente, spirâ utrinque umbilicatâ, umbilico aut perspicuo, aut occulto; multilocularis, loculis regularibus, septis transversis, internè convexis, siphunculo continuo subcentricè perforatis.

The two great conchiferous Cephalopods, *Argonauta* and Nautilus,

Plate CCXCVIII.

Spirula Peronii.

seem to have been equally well known to the father of natural history; for in Scaliger's translation of the 'Historia Animalium' we learn that Aristotle, when speaking of his *Polypi*, or *Cephalopodous Malakia*, makes especial mention of two of them having shells. They were both regarded by this venerable philosopher as species of Nautilus; "the one," says Aristotle, "has a hollow shell, not naturally adherent to it; the other has a shell, which like a snail it never quits." Here, however, remained the history of these mollusks for ages. Pliny, and indeed other writers subsequent to Aristotle, seem only to have noticed one of the Nautili of their predecessor, for their observations embody little beyond what he had transmitted to them of his *Nautilus primus*, the light monothalomous *Argonaut* of Linnæus. The *Nautilus secundus* of the ancients remained in obscurity until the revival of letters; Belon, a French author of 1550, gave a representation of the shell; and its animal inhabitant was figured in 1703 by Rumphius, a Dutch merchant and naturalist resident at Amboyna. Although an accurate delineator of character for the age in which he lived, he was no anatomist, and his drawings are somewhat inaccurate; having lost his sketches, he is said to have renewed them from recollection; they have, however, been valued from necessity, for no other living specimen of this mollusk was discovered for the lapse of a century and a quarter.

Cuvier, the first great anatomist who tested the organism of the Cephalopods by minute dissection, looked with earnest solicitude, no doubt, for the soft and living portion of the Nautilus; but the act which made at last so prominent a step in the history of these animals, was reserved for a no less skilful operator of our own day. A Nautilus was captured in 1829 in the Bay of Marekini, at the Island of Erromango, New Hebrides; it was seen floating on the surface of the water, and was just about to sink, when a sailor caught hold of it with a boat-hook. The right eye was almost shattered in the struggle to secure it, and the shell being much broken it was injudiciously removed. Two years unfortunately elapsed before the soft parts, which were carefully preserved in spirits, reached England; they were presented to Mr. Owen for dissection; and although a minute portion of shell, adhering to one of the lateral

expansions of the belt, was all that remained of the original frame-work, he admirably succeeded, by a train of analogical reasoning, to establish the relation of the whole. His celebrated 'Memoir on the Pearly Nautilus*' was published in London in 1832 by the Royal College of Surgeons, and to the severe disappointment of the author, the illustrious Cuvier died but a few days before it issued from the press.

Although the animal of the Nautilus was an important acquisition to conchological science, it would have been far more acceptable if accompanied with the shell: a doubt immediately arose amongst naturalists, as to whether the position which Mr. Owen had assigned to the animal in the shell was the true one. "*Mais dans quelle position,*" asks De Blainville, "*le Nautile est-il dans sa coquille?*" "*And if,*" says Mr. Gray, "*the relative position of the animal of the Nautilus be correctly assigned by Mr. Owen with respect to its shell,*" *it must offer a similar anomaly to the genera* Patella *and* Lottia.

In 1840 two more specimens of the Nautilus were procured after a long and arduous search, by a Dutch gentleman at New Guinea. One was sent to the public museum of Leyden, and the other to Paris; but as these also were destitute of their calcareous envelope, an investigation of them could add little to what had been already advanced by Mr. Owen. M. Valenciennes, however, with a laudable desire, probably, of emulating his predecessor, undertook the dissection, and a skilful memoir was the result, though not containing much of novelty beyond a difference in his calculation of the tentacles, and the demonstration of an organ of hearing†. His observations are conducted with accuracy and plainness, but the memoir is not so rich in that eloquent analogical reasoning which so vividly characterizes the writings of his contemporary. The opportunity

* The very elaborate character of this memoir directly stamped its author as the first zootomist of the day. The smallest nerve has its immediate office assigned to it, the simplest organ its peculiar function; the component systems are traced with the most rigorous accuracy, and the inferences that are deduced from a consideration of the whole, exhibit a fertility of imagination that renders an abstruse subject as pleasing as it is full of scientific interest.

† Mr. Owen says on this head, "With respect to the sense of hearing, I have not been able to detect a distinct organ for that faculty."

that was thus afforded the continental professor of examining the soft parts of the Nautilus, was highly satisfactory to Mr. Owen, for he arrived at precisely the same conclusion as himself in regard to their relation with the shell. "*En confirmant,*" says Valenciennes, "*la manière de voir de M. Owen, si juste et si conforme à la nature, j'ai établi l'animal dans la vraie place occupée par lui dans sa coquille, je ne laisse plus aucune discussion raisonnable possible sur ce point.*" Here, however, was no direct proof, the testimony of both the learned professors was alike circumstantial; indeed, the very necessity for the introduction of the word *raisonnable* in this statement proclaimed it to be an hypothesis. Mr. Owen was himself singularly destined to prove the truth of his conjecture, for only two days since a magnificent specimen of the Nautilus, with its shell entire, was presented to him by Capt. Belcher, R.N. The individual in question was captured by that gentleman at Amboyna, not long since; it was secured alive, and has been preserved, together with its shell, in spirits without the slightest injury. When put into Mr. Owen's hands, he was extremely gratified to behold that the animal held exactly the position in its shell that he had ventured to assign to it; and we doubt not but that M. Valenciennes will be as highly pleased to find that his expectations have been so soon realized*.

Having detailed the history of the Nautilus from the time of Aristotle to the present day, it now remains for us to speak of its structure and general habits. The soft parts of this animal form a kind of oblong mass, such as may be supposed capable of fitting into the porch or aperture of its well-known shell, and, like the rest of the Cephalopods, consist of two parts. The anterior or outer part incloses a well-developed head, with a

* We shall not readily forget the glorious delight of the Hunterian Professor, as he hurried past our door only yesterday on his way to the Zoological Society; his treasure proudly suspended in an anatomical jar; himself loaded with the controversial theories of his contemporaries, that he was about to level at a breath. Nor can we fail to remember his animated enthusiasm at the Meeting, when, holding up the precious truant, fresh as it were from its native element, without a fracture, and apparently dozing under its capacious hood, he proved, beyond the possibility of contradiction, the generalizations he had so admirably worked out as a student ten years before by an ingenious complication of analogies.

pair of strong, horny mandibles, a mass of some thirty or forty tentacles, and a number of delicate structures, including the organs of smelling, hearing, seeing, &c.; and over all these parts is a capacious fleshy hood, which may be considered as the analogue of the operculum in the Gastropods. The inner or posterior part of the body contains the viscera, with a funnel or vent-hole extending from beneath the tentacles, and the entire abdominal mass, together with the breathing apparatus, is enveloped by a large sack-like mantle fitting into the hollow of the shell. The anterior portion of the mantle, or that which is attached to the back part of the head, is produced into a considerable fold, which overlaps the involuted convexity of the shell, and from the lower extremity of the entire body extends a central membranous tubiform process, which, by passing the siphonic apertures of the septa, extends completely through the convolutions of the shell, from chamber to chamber, until it is fastened to the nucleus or parietal wall of the central or first-formed chamber. Around the circumference of this abdominal sack there is a thin layer of horny matter, called the belt, expanding on each side into a kind of broad patch, and becoming the medium of muscular attachment.

The natural position, then, of the Nautilus in its shell, is with the back of the head and concavity of the hood against the camerated convexity of the spire, and the funnel resting on the outer concave wall of the chamber: the tentacles are consequently protruded over the lateral margins of the aperture, and the body is retained within the shell by the adhesion of the membrane and the horny girdle.

The following appears to us to be the manner in which the Nautilus constructs its shell. The animal in its embryo formation deposits a simple hollow shell, out of which it necessarily advances as it increases in bulk; and in order to assist its specific gravity at the bottom of the ocean, the vacated portion of the shell is chambered in by the secretion of transverse septa, the animal having first taken the precaution to secure a strong tubiform membrane to the inner wall, in order to adjust its position (a consideration of the habits of this pelagic mollusk will show the necessity for this membrane). As the soft parts increase in bulk, the muscular girdle which binds them to the shell would naturally be forced

from any adhesion ; but from its being furnished with a certain degree of elasticity, it advances by a series of periodical slips, the suddenness of which is undoubtedly counteracted by the attachment of the central membrane. The growth of the shell then proceeds in a circular direction, and serves to buoy up its inhabitant in the water by having the vacated portion chambered in to meet its specific gravity. The geometrical increase of it arises simply thus. The natural position of the Nautilus, like other Cephalopods, is with its head downwards, the shell being consequently above ; and the periodical slip of the belt of adhesion most probably takes place when the animal is in this supine position. It lets itself down, and round and round, as it were, upon its axis, by the limited extension of this membranous pulley ; the operation ceases when it arrives at maturity, and the membrane being no longer wanted, probably decays. Such is the manner in which our observations lead us to suppose the Nautilus grows ; the chambers have certainly no communication with the surrounding fluid. The camerated portion of the shell of Nautilus is evidently a simple, mechanical construction, (though planned by the wisest intelligence,) to assist the specific gravity of its inhabitant whilst under the different mutations of pressure that it is liable to at different periods of growth in its passage through the element ; and it is, moreover, a contrivance that could only be effected by the aid of this adjusting membrane upon the simple geometry of motion above described*.

* The principle here advanced, of the geometrical formation of the Nautilus shell round its axis by the aid of an adjusting membrane, and of its camerated construction being accommodated to the specific gravity of the inhabitant, will, perhaps, receive additional weight by a consideration of the following passage from the 'Memoir' of Professor Owen :—

"In sections of recent shells, its [the membrane's] dried remains may occasionally be seen of a black colour and pergameneous texture, continuing from septum to septum as far as the central or first-formed chamber: and a further confirmation that this is the true structure of the parts, is afforded by the fossil shells of this genus. In some polished sections of these remains, not only is the continuation of the tube through all the chambers evident, but it is seen to become slightly dilated in them, and in some instances appears also to have been reflected over the outer part of the testaceous tube prior to being continued across the chamber to the next partition. There is no indication, however, of the latter structure in the recent shells where the membranous tube is preserved."

M. Valenciennes regards the periodical introduction of a partition in the shell of Nautilus as in some measure analogous to the occasional deposit of a varix in the shell of *Murex* and other Gastropods. The septa, like the varices, may undoubtedly be secreted by the mantle during a period of rest, but there the analogy ceases. We would rather compare the rotatory increase of the Nautilus to the horizontal growth of that singular Gastropod, the *Magilus* (vide p. 231). The one gravitates round a centre, increasing by a peculiarity of contrivance the volume and comparative buoyancy of its shell to keep pace with the surrounding pressure, which naturally increases in intenseness as the subject increases in bulk; the other having a different medium to combat with, namely, the outward increase of the coral in which it is imbedded, leaves its spiral plan of construction to pursue a straight growth, and, raising itself forward, fills the vacated portion of the shell with an extraordinary secretion of solid matter. If the *Magilus* had advanced by a deposit of transverse septa, instead of solidifying its shell, the increase of the madrepore might have crushed it; and if the Nautilus had advanced by the solidifying of its shell instead of by the deposit of transverse septa, it would have produced an incumbrance incompatible with its locomotive faculties.

We are now brought to the consideration of the habits of the Nautilus. It is evidently, as Mr. Owen expresses it, "a ground-dwelling animal," creeping along the bottom of the sea, with hood and tentacles, at a tolerably quick pace; and the shell, being above its head, must greatly assist the animal in its movements, from a tendency to float. It is not improbable but that the Nautilus may use a certain hydrostatic influence over the branchial cavity to enable it to rise to the surface. Valenciennes says, "*Il nage avec facilité dans le sein des eaux en faisant sortir avec force la grand quantité d'eau contenue dans sa cavité branchiale.*" And the testimony of Rumphius in respect to its capacity of floating, cited by Mr. Owen, is of so much interest, considering the time in which it was written, that we venture to repeat it.

"When he thus floats on the water, he puts out his head, and all his barbs (tentacles), and spreads them upon the water with the poop (of the shell) above; but at the bottom he creeps in the reverse position, with

his boat above him, and with his head and barbs upon the ground, making* a tolerably quick progress. He keeps himself chiefly upon the ground, creeping sometimes also into the nets of the fisherman; but after a storm, as the weather becomes calm, they are seen in troops floating on the water, being driven up by the agitation of the waves: whence one may infer that they congregate in troops at the bottom. This sailing, however, is not of long continuance; for having taken in all their tentacles, they upset their boat, and so return to the bottom." This account, published at Amsterdam more than a hundred years ago, is mainly authenticated; but it may still be a little exaggerated, for the Nautili have never since been found floating in troops, nor exercising the bold familiarity, above-mentioned, of walking into the fisherman's nets.

The shell of Nautilus may be described as being orbicular, symmetrical, divided into a number of chambers, generally about forty, and convoluted on a vertical plane, with the whorls contiguous, the last one completely covering all the others. It is a firm shell, distinctly marked with transverse brownish bands, and is composed of two distinct layers, an outer coat of opake testaceous substance, and a lining of bright nacre. The axis of the spire is umbilicated on each side, and the umbilicus is sometimes open, sometimes filled up with the matter deposited by the overlapping fold of the anterior portion of the mantle. The septa which divide the chambers are convex on the inside, and perforated throughout with a central siphonic tube, which is more or less calcareous; the aperture of the shell is large, and the margins are simple. The muscular impression of the horny girdle by which the animal has been attached to its shell may be distinctly observed in every chamber†.

* By force of gravity probably.

† We have somewhat exceeded the usual limit of our observations in speaking of the Nautilus, but the fulness and importance of its history demand especial service. It is important to the naturalist, but far more so to the geologist; for, as Professor Owen eloquently expresses it, "it is the living, and perhaps sole living archetype of a vast tribe of organized beings, whose fossilized remains testify their existence at a remote period, and in another order of things."

Example.

Pl. CCXCIX. Fig. 1.

NAUTILUS POMPILIUS, Linnæus (Gmelin's edit.), p. 3369. Rumphius, Mus., pl. 17. f. A. and C. Martini, Conch., vol. i. pl. 18 and 19. f. 164 and 165. Vignette, vol. i. p. 222. Owen, Memoir on the Pearly Nautilus, pl. 1 to 8. De Blainville, Anatomie de la Coquille du Nautile, Nouvelles Annales du Muséum, vol. iii. p. 1. pl. 1 and 2. f. 1 and 2. Valenciennes, Nouvelles Recherches sur le Nautile, Archives du Muséum, p. 257. pl. 8 to 11.

Nautilus secundus, Aristotle.

Nautilus major, Rumphius.

Nautilus maximus, D'Argenville.

Order II. CEPHALOPODA MONOTHALAMIA.

Testa cymbæformis, externa, illoculosa, simpliciter involuta.

The plan which we have here adopted for the ordinal division of the Cephalopods was introduced more than a hundred years since by Breynius, a naturalist of Dantzic. It is not, as before stated, in good concordance with the organization of the animals, for, according to the structure of the breathing apparatus, as shown by Mr. Owen, there is a much closer affinity between the *Spirula* and the *Argonaut*, than between the siphoniferous genera *Spirula* and *Nautilus*. So few of the Cephalopods are conchiferous, that it is extremely difficult to introduce a natural arrangement of them in a "System of Conchology." The anatomical characters of the Mollusca can only be strictly followed in treating of the entire series, both conchiferous and naked; and it only remains for us, therefore, to characterise the monothalamous kinds referred to this order as having a light, open, papyraceous, boat-shaped shell, which is external

1. Nautilus Pompilius
2 . simplex?

and simply involuted. They are few in number, and included in the following genus:

ARGONAUTA.

ARGONAUTA, Linnæus.

Testa subnavicularis, illoculosa, papyracea, tenuissima, in spiram discoideam leviter convoluta; spirâ bicarinatâ, propè in testæ aperturam subimmersâ; carinis plus minusve tuberculosis.

The *Nautilus primus*, or "Paper Nautilus" of Aristotle, was separated about the middle of the eighteenth century from his *Nautilus secundus*, or "Pearly Nautilus," by Gualtieri, an Italian conchologist, under the title of *Cymbium*: it was distinguished too by his Swedish contemporary Linnæus about the same time under that of Argonauta; and the increasing celebrity of that writer soon obtained for his name the preference. The observations of those authors were, however, still confined to the shell; the Professor of Pisa added little more to the early history of the Argonaut than the Professor of Upsal; and the zoological world was warmly divided on the nature and affinities of its inhabitant. Bruguière, Lamarck, De Montford, Ocken, De Roissy, Leach, Cuvier, De Férussac, De Blainville, Rafinesque, Deshayes, and Gray advanced little beyond a speculative series of hypothetical arguments, the final observations of Lamarck being the most accurate because least hypothetical. The complete demonstration of this animal was singularly reserved for the skilful anatomist of the "Pearly Nautilus," for its true relation and character was established only five years since by the very laudable exertions of Mr. Owen.

The body of the Argonaut retains so little muscular adhesion with the shell, and presents altogether such an apparent anomaly of structure, that the learned were for a long time suspicious of their natural relation; they believed that the octopodous Cephalopod usually found with this elastic envelope was neither its fabricator nor lawful owner. Some indulged a

notion that it was the shell of a huge night-swimming *Pteropod*; others, that it was the branchial protector of a mollusk of homologous nature with the *Carinaria*; and it is certainly to be regretted that the last of these absurd hypotheses should be tolerated by an eminent zoologist in the present day in the face of indisputable proof to the contrary*.

Every doubt on the subject has been fortunately dispelled by the united efforts of Madame Power and Professor Owen; the former resident at Messina, by an interesting course of experiments on living subjects; the latter, by a train of anatomical deductions from the specimens so experimented upon†. M. Rang, an intelligent traveller in Algiers, has also contributed somewhat to the elucidation of the subject, but the controversy was finally silenced by the observations and reasonings above mentioned.

The Argonaut, like the rest of the Cephalopods, consists of two distinct parts; the viscera or abdominal portion contained in a sack-like mantle, and the head or cephalic portion crowned with tentacles. The tentacles, which are eight in number, are profusely armed with a number of strong and powerful suckers; there is also a funnel or vent-hole, and the breathing apparatus, under certain modifications, is not much unlike that of the

* In the last 'Synopsis of the Contents of the British Museum,' dated 1841, Mr. Gray unhesitatingly says, "Here must be placed for the present (immediately after *Carinaria*, a *Nucleobranchiate Gastropod* of his family *Pterotracheidæ*), on account of the similarity of the form and texture of the shell, the Paper Nautilus (*Argonauta*). As yet only a peculiar kind of Cuttle-fish, with a web to the end of the longer arms, has been found in the Argonaut shells; but there are many reasons for believing that this is only a parasite, adapted by its form to live in such shells, as the web of the arms is used by the animal to embrace the shell and keep it in its right position on the body."

If the Argonaut shell, which obtains a very large size, bears the same relation to its here-assumed fabricator as the shell of the *Carinaria*, covering in the same manner a mere branchial nucleus on the back, there must, indeed, be a fleet of these animals in the Mediterranean of no ordinary dimensions to supply the shells that are so abundantly found there; (more than a thousand specimens are before us at this moment!) they must be furnished, too, with no common degree of instinct to have so long escaped the vigilance of their pursuers.

† These specimens, exhibited by Mr. Owen to the Zoological Society in 1839, were twenty in number; the smallest had a shell weighing only a grain and a half, and the remainder presented a perfect correspondency of increase up to the common-sized mature individual.

Nautilus. The two hindermost or dorsal pair of tentacles present, however, a modification of structure in this octopod unlike any of the class. The Argonaut possesses the peculiar faculty of secreting a light boat-shaped shell, for the purpose of containing her eggs; and as this elastic envelope could not serve to protect the ovary, if it had been moulded as in the *Nautilus*, immediately on the body, it is formed from the outside by an expansion of each of the dorsal tentacles, which undertake the office of calcification like the expanded lobes of the *Cyprææ**. The calcifying power is thus transferred from the mantle to this pair of arms or tentacles; it is, however, much more feebly developed than in the *Nautilus*; the shell remains in a perfect state of elasticity during the life of the animal, and it contracts and swells to suit the respiratory and locomotive movements of its inhabitant.

The velated or web-like arms, so celebrated in poetic fiction as supplying the service of sails†, are much larger in some species of *Argonauta* than in others; (for there are several distinct kinds of Argonauts, each presenting, with a constancy of correspondence in their shells, a joint assemblage of characters specifically distinct from each other;) in the *Argonauta argo*, for example, the common species of the Mediterranean,

* In the living Argonauts alluded to as having been experimented upon by Madame Power, she distinctly observed the gradual formation of the shell as above described; and upon purposely breaking it whilst the animal was in life and vigour in her marine vivarium, she was still further gratified to find that the fracture became duly repaired under the influence of the calcifying membranes. We have also the additional testimony of D'Orbigny on this head, who relates having frequently discovered Argonauts with the margin of the shell in a membranous and soft state, from having just received an additional secretion of calcareous matter.

† "These membranes," says Owen, "have been described by naturalists and poets, from Aristotle and Callimachus down to Cuvier and Byron, as serving the office of sails; the animal being supposed to have the power of rigidly extending the soft fleshy arms which support the membranes, and maintaining the latter tensely outstretched to meet the breeze. It is scarcely necessary to observe, that the structure of the parts in question is incompatible with this hypothesis of the use of the *vela* in navigating the frail boat of the *Argonaut*." "It has been ascertained, indeed," continues the Professor, "by direct observation, that these *vela*, or rather *velamenta*, have not only a relation of coexistence, but one of direct physiological import to the development of the shell, serving as the organs both of secreting and of retaining this part."

the velamenta are expanded so as entirely to grasp each side of the shell, and when the animal is captured, they are suddenly retracted, in a state of alarm, and thrust down each side between the body and the shell so as to be plainly seen through it from the outside; the shell being thoroughly permeable to light, in its native condition, and not preventing the flesh of its inhabitant from assuming a certain degree of colour. We learn from the well-directed observations of Mr. Owen, that neither the membranous arms nor the shell are developed until some days after the Argonaut is excluded from the egg*, and this accounts for the comparative enormity of the nucleus. "The young Cephalopod," he observes, "manifests a complete concordance between the form of its body and that of its shell, entirely filling the cavity; and it has been noticed that at a certain age the animal begins to withdraw the extremity of the sack or abdominal portion of the body from the apex of the shell, to serve the purpose of oviposition, and this operation has been found to commence exactly and only when the ovarium begins to enlarge under the sexual stimulus."

It may have been already noticed, from what has been said of the Argonaut, that its entire history, both as regards the habits and organic structure of this animal, relates to the female. The fact is, that a male Argonaut does not yet appear to have been found, and it still becomes a question, as to whether the male produces a shell at all†. Several male Octopods have been discovered; one variety indeed, says a correspondent of the Zoological Society, is very abundant in the Bay of Naples, and daily to be seen in the common market as an article of food: all of these,

* "In the ova most advanced, the distinction of head and body was established; the pigment of the eyes, the ink in the ink-bladder, the pigmental spots on the skin, were distinctly developed; the siphon, the beak, and the arms, were also discernible by a low microscopic power; the arms were short and simple; but *the secreting membranes of the shell were not developed, and of the shell itself there was no trace.* In the second memoir published by Madame Power (1838), it is stated that the young Argonaut is excluded from the egg, as such, but naked, twenty-five days after oviposition, and that *in ten or twelve days more, she discovered that they had formed their little shell.*"—Owen *on the Argonaut.*

† An Argonaut once discovered by Rafinesque without its shell, was immediately described by that author under the new generic title of *Ocythöe.*

Argonauta Argo.

however, seem specifically distinct from the "Paper Sailor," nor are any of them conchiferous. Another circumstance in the history of these animals is, the known paucity of males as compared with females, the proportion being scarcely one in twenty; they are well known to dwell (both sexes together) in deep water, and it has been conjectured that the females rise to the surface to receive the warmth and genial influence of the sun. The male Argonaut, then, still remains to be discovered. If we are to take the naked Octopus of Naples as a mate for the Argonaut, it may be no less wonderful than true, that the calcifying membranes, and consequently the shell, are a sexual provision peculiar to the female, subservient to her generative economy; a modification in Nature which is almost without a parallel.

The shell of Argonauta may be described as being somewhat boat-shaped, and not divided into chambers; it is papyraceous, very thin, and slightly convoluted into a discoid spire, which is doubly carinated and partially immersed within the aperture; the keels are more or less tuberculated

Example.

Pl. CCC.

ARGONAUTA ARGO, Linnæus (Gmelin's edit.), Syst. Nat., p 3367. Martini, Conch., vol. i. p. 231. pl. 17. f. 157.

Ναυτίλος, Aristotle.

Nautilus Nauplius, Bonani.

Nautilus papyraceus, D'Argenville.

Nautilus tenuis, Knorr.

Cymbium maximum, Gualtieri.

Argonauta argo, Linnæus, Lamarck, &c.

We have now completed an arrangement of "*The Lepades and Conchiferous Mollusca*," which, it is much to be regretted, though modelled from that of our immortal prototype Lamarck, with all the improvements of subsequent learning and discovery, is still imperfect for want of a complete

basis of anatomical accuracy. We anticipate, however, the additions to our knowledge which the past seems to presage; the time may come when the habits and organic structure of the Mollusca will be as familiar as the anatomy of our own species, and the nature and animal affinities of their shells understood by every lover of Conchology without recourse to forced and dangerous trains of analogical reasoning. Much remains to be done: in the precious depositories of Nature, as says our pious forefather Ray, "is employment enough for the vastest parts, the most indefatigable industries, the happiest opportunities, the most prolix and undisturbed vacancies."

NOMENCLATURA ALPHABETICA.

A.

	Page
Abida	68
Acardia	51
Acarus	68
Acera	47
Achatina	84
Acmea	151
Adelosina	289
Agaronia	236
Agathirses	44
AGATHISTIGUA	289
ALATA	198
Alcadia	101
Alectryon	235
Alveolina	288
Amicula	9
AMMONOIDES	290
Amphibulina	89
Amphipeplea	114
AMPHISTEGINA	288
Ampullacera	130
Ampullaria	129
Ampulloidea	130
Amygdala	49
Anaulax	241
Ancillaria	240
Anculotus	122
Ancylus	117
ANGYOSTOMATA	246
ANNELIDES	43
Anomalina	290
Anostoma	73
Aplexus	114
Aplustra	48
Aplysia	53
APLYSIANA	52
Apollon	195
APOROBRANCHIATA	273
Aporrhais	202

Page

Aquillus 197
Arcularia 236
Argonauta 305
ARISTEROBRANCHIATA 16
ARTICULATA . . . 7
Articulina 289
ASIPHONOBRANCHIATA 37
Asolene 130
Atlanta 277
Atys 48
Auricula 104
AURICULACEA 103
Auris 41
Avena 268

B.

Bigenerina 291
Biloculina 289
Bonellia 153
Brontes 192
Buccinum 233
Buffo 195
Bulimus 78
Bulimina 290
Bulla 47
BULLACEA 47
Bullæa 48
Bullia 244
Bulliana 244
Bullina 48

C.

Calcar 164
Calcarina 290
Callia 91
Calpurnus 265
Calypeopsis 30
Calyptræa 30
CANALIFERA 176
Cancellaria 181
Cantharidus 164
CAPULACEA 27
Capulus 35
Carinaria 56
Carocolla 71
Carolina 276
Carychium 105
Cassidaria 208
Cassidea 209
Cassidulina 290
Cassis 212
CELLULACEA 287
CEPHALA 1
CEPHALOPODA . . . 280

Page
Ceratodes 130
Cerithium 176
CERVICOBRANCHIATA . 16
Chicoreus 192
Chilina 109
Chilotrema 68
CHISMOBRANCHIATA . 37
Chiton 8
Chitonellus 12
Cimber 133
Cionella 68
CIRRHOBRANCHIATA 4
Clanculus 164
Clausilia 77
Clavatula 186
Clavulina 290
Cleodora 276
Clio 278
Clithon 137
Cochlea 224
Cochlicella 65
Cochlicopa 65
Cochlitoma 65
Cochlodina 65
Cochlodonta 65
Cochlogena 65
Cochlohydra 65
Cochloides 65
Cochlostyla 65
Colimacea 64
Columbella 216
Columellata 245

Page
Concholepas 224
Conchopatella 225
Conohelix 251
Conus 105
Conovulus 268
Convoluta 257
Corona 167
Crepidula 27
Crepipatella 30
Creseis 278
Cricostomata 90
Cristellaria 291
Cryptella 60
Cryptostoma 39
CTENOBRANCHIATA . . 16
Cucumis 249
Cuvieria 279
CYCLOBRANCHIATA . . 7
Cyclops 235
Cyclostoma 95
Cyclostomacea 90
Cyclostomidæ 90
Cylinder 269
Cylindrella 75
Cyllene 234
Cymba 256
Cymbium 305
Cymbulia 279
Cypræa 261
Cypræcassis 213
Cyprovula 262
Cythara 236

D.

	Page
Delomphalus	68
Delphinula	156
Delphinus	156
Demoulia	236
Dendritina	290
Dentalina	293
Dentalium	5
Dentellaria	68
Dimorphina	291
Diodora	23
Dolabella	54
Doris	55

E.

Eburna	238
Ellipsostomata	90
Emarginula	22
Enallostigua	291
Entomostigua	288
Entomostomata	208
Epistylium	68
Erato	259
Erpetometra	93
Eulima	153
Eurybia	279

F.

Fabularia	288
Fasciolaria	183
Ficula	190
Fissuracea	17
Fissurella	24
Fissurellidia	25
Foraminifera	286
Frondicularia	293
Fulgur	190
Fusiformia	176
Fusus	184

G.

Page
Galeolaria 43
GASTEROPODA . . . 1
Gastroplax 51
Gemmulina 292
Geotrochus 68
Gibbus 68
Glandulina 293
Globigerina 290
GONIOSTOMATA . . . 150
Guttulina 291
GYMNOBRANCHIATA . 7
GYMNOSOMATA . . . 274
Gyroidina 290

H.

Haliotis 41
Harpa 225
Helcion 15
Helicarion 63
Helicella 63
Helicigona 65
Helicina 100
Helicobulimus 79
Helicodonta 65
Helicogena 65
Helicoides 65
Helicolimax 63
Helicophanta 65
Helicostigua 290
Helicostyla 65
Helix 67
Hermes 269
HETEROPODA . . . 57
Heterostegina 288
Hipponyx 33
Hyalæa 275
Hyalina 68

I.

Ianthina 144
Ianthinea 143
Iberus 68
Imbricaria 251
Imperator 166
INCLUSÆ 65
Infundibulum 30
Io 122

L.

	Page
Lachryma	261
Lamprodoma	236
Lanistes	130
Latirus	180
Lepas	14
Leptoconchus	232
Lepus	53
Lignus	84
Limacina	277
LIMACINEA	59
Limax	60
Lingulina	293
Lithedaphus	32
Litiopa	236
Littorina	169
LITTORINIDÆ	120
Lobaria	47
Lotorium	197
Lottia	17
Luponia	262
Lymnæa	114
LYMNÆANA	111

M.

Macrochisma	25
Macrospira	68
MACROSTOMATA	36
Magilus	230
Malea	228
MALENTOZOARIA	7
Margarita	168
Marginella	248
Marginulina	293
Marinula	105
Megalomastoma	96
Megaspira	75
Melampus	105
Melania	121
MELANIANA	119
Melanopsis	123
Melo	255
Mesomphyx	68
MILIOLIDÆ	289
Mitra	250
Mitrella	251
Mitreola	251
MOLLUSCARTICULATA	7
Monoceros	222
Monodonta	164
MONOPLEUROBRANCHIATA	19
MONOTHALAMIA	304
Morio	209
Moulinsia	91
Mucronina	293
Multiloculina	289
Murex	191

N.

	Page
Nanina	63
Nassa	235
Natica	142
Nautiloides	291
Nautilus	296
Nerita	138
Neritacea	132
Neritopsis	140
Nodosaria	292
Nonionina	291
NUCLEOBRANCHIATA	55
NUDIBRANCHIATA	7
Nummulina	291

O.

Ocythöe	308
Odontostylus	68
Oligyra	100
Oliva	242
Olivella	236
Omalonyx	68
Oniscia	210
Operculina	290
Orbiculina	288
Orthocera	293
Orthoceratia	293
Orthocerina	293
Otis	110
Ovula	264

P.

Pachystoma	130
Padollus	42
Paludestrina	128
Paludina	127
Paludinidæ	120
PARACEPHALOPHORA	1
Parasitica	173
Parmacella	59
Parmophorus	21
Parthenia	153
Partula	82
Patella	14
Patelloida	18
Patera	257
Pavonina	293
PECTINIBRANCHIATA	118

Page
Pedipes 105
Peloronta 139
Peneroplis 291
Perdicia 220
Peribolus 262
PERISTOMATA 125
Persicula 250
Persona 197
Phasianella 170
Phorus 159
Phos 235
PHYLLIDIANA 49
Physa 114
PHYTOPHAGA 119
PILEIFORMIA 27
Pileopsis 35
Pirena 123
Pitonillus 161
Planaxis 237
Planorbis 112
Planorbulina 290
Planularia 293
Planulina 290
Platystoma 141
Plekocheilus 79
PLEUROBRANCHIATA . 46
Pleurobranchus 50
Pleurodonta 68
Pleurotoma 186

Page
PLICACEA 145
PNEUMONOBRANCHIATA 20
Polinices 142
Pollia 234
Polliana 244
Polydontes 68
Polygonum 180
Polygyra 68
Polymorphina 292
Polyphemus 84
Polystomella 290
POLYTHALAMACEA . . 287
POLYTHALAMIA . . . 285
Potamis 177
Priamus 85
Proserpina 68
Psyche 279
Pterocera 203
Pterocyclos 96
PTEROPODA 272
PULMOBRANCHIATA . 58
Pupa 74
Pupillia 25
Pupina 91
Purpura 219
PURPURIFERA 207
Pyramidella 148
Pyrula 189
Pythia 84

Q.

Quinqueloculina 289
Quoyia 236

R.

	Page
Radius	265
Ranella	195
Rapa	191
Rapanus	190
REDUNDANTES	65
Rhizopodes	287
Ricinula	214
Rimula	23
Rimulina	293
Ringicula	236
Rissoa	151
Rissoina	152
Robulina	291
Rollus	269
Rosalina	290
Rostellaria	201
Rotalia	290
Rotella	161

S.

Sabia	34
Sagrina	292
Saxicolina	289
Scala	155
Scalaria	155
Scalariana	150
Scandalinum	135
Scaphander	48
Scaphula	236
Scarabus	107
Scolymus	180
Scuta	21
SCUTIBRANCHIATA	16
Semiphyllidiana	49
Septaria	133
Seraphs	268
Serpula	43
Siderolina	291
Sigapatella	30
Sigaretus	38
Siliquaria	43
Simnia	265
Siphonaria	19
Siphonifera	294
Siphonoidea	294
Siphonostoma	73
Siphonostomata	176
Siphopatella	30
Sistrum	214
Solarium	158
Soldania	290
Sphæroidina	292
Spiratella	277
Spirolina	291

Page

Spiroloculina 289
Spirorbis 43
Spirula 295
Sticostigua 292
Stomatacea 36
Stomatella 40
Stomatia 40
Streptaxis 75
Strombus 206
Struthiolaria 199
Stylifer 174
Stylina 174
Succinea 88

T.

Tapada 68
Tectus 164
Terebellum 266
Terebra 244
Testacellus 61
Textularia 291
Thalassiarchus 270
Thecosomata 274
Theodoxus 137
Tiara 251
Tomogerus 74
TRACHELIPODA . . 64
Trichotropis 229
Triloculina 289
Triton 196
Trivia 262
Trochapatella 30
Trochus 162
Truncatella 93
Truncatellidæ 90
Truncatulina 290
Tubispiracea 43
TUBULIBRANCHIATA . 16
Turbinacea 150
Turbinellus 179
Turbinoides 290
Turbo 166
Turris 251
Turritella 171
Typhis 194

U.

Ultimus 265
Umbrella 51
Unicornus 222
Uviferina 290

V.

	Page
Vaginulina	293
Valvata	126
Valvulina	290
Vanikoro	141
Vanikoroidæ	141
Varicosa	176
Velates	137
Velutina	37
Vermetus	45
Vermicularia	45
Vermilia	43
Vertebralina	290
Vertigo	75
Vespertilio	203
Virgulina	292
Vitrina	62
Vivipara	127
Voluta	253
Volvaria	246
Vulpecula	251
Vulvulina	291

Z.

Zonites	68
Zoophaga	119

SPECIERUM CATALOGUS.

A.	Pl.	Fig.
Achatina alabaster	178	9
bicarinata	178	13
columnaris	178	14
dactylus	179	16
fasciata	178	11 & 12
Kransii	179	19
lactea	177	6
leucozonias	176	3
picta	178	10
purpurea	176	1
regina	177	7 & 8
Richii	177	4
rosea	179	15
tincta	179	18
ustulata	177	5
virginea	176	2
zebra	179	17
Amphidesma australe	47	4
formosum	48	7
læve	48	6
pallidum	47	3
pulchrum	47	2
purpurascens	48	5

	Pl.	Fig.
Amphidesma roseum	47	1
Ampullaria cornu arietis	198	3
rugosa	198	1 & 2
subcarinata	198	4
Anatina Norvegica	34	2
truncata	34	1
Anatinella Sibbaldii	38	1 & 2
Ancillaria australis	272	1 & 2
castanea	272	8
glabrata	272	4 & 7
marginata	272	5
Mauritiana	272	3
rubiginosa	272	6
Ancylus fluviatilis	193	1
lacustris	193	2
Anodon anatinus	91	1 & 2
Anomia ephippium	124	1 to 3
Anostoma globulosum	169	2
ringens	169	1
Aplysia Brasiliana	156	2
concava	156	3
Petersoni	156	1 & 5
quadrata	156	4
Arca granosa	82	2

	Pl.	Fig.
Arca inæquivalvis	82	3
Noæ	82	1
Argonauta argo	300	1
Aspergillum sparsum	17	3 to 5
vaginiferum	17	1 & 2
Astarte Damnoniensis	66	1 to 3
modiolaris	66	4
Auricula angulifera	187	5
australis	187	3
coniformis	187	7
felis	187	6
Judæ	187	4
labrella	187	2
lutea	187	11
Midæ	187	10
monile	187	8
pepita	187	1
stagnalis	187	9
Avicula aculeata	109	2
heteroptera	109	1
margaritifera	110	1

B.

	Pl.	Fig.
Balanus circinatus	7	3
galeatus	7	6 to 8
Montagui	7	4 & 5
spinosus	7	2
tulipa	7	1
Buccinum elegans	268	3
melanostoma	268	7
moniliferum	268	4
pyrostoma	268	1
serratum	268	5 & 6
undosum	268	2
Bulimus bicoloratus	172	5 & 6
Boholensis	172	3
Crichtoni	173	4
Bulimus Diana	172	2
eximius	173	2
fictilis	173	1
fulgetrum	172	4
gallina-sultana	173	7
Janeirensis	171	97
Milleri	171	94
Mindoroensis	173	5
multicolor	174	89
Myersii	174	90
Onca	173	3
piperitus	174	93
Reevii	172	1
smaragdinus	173	6
Bulla albocincta	153	7 & 8
aperta	153	3
aplustre	153	2
canaliculata	153	4
fasciata	153	1
lignaria	153	5
scabra	133	6

C.

	Pl.	Fig.
Calyptræa cinerea	144	4
lignaria	144	3
lithedaphus	144	5 to 7
radians	144	2
rugosa	144	1
Cancellaria buccinoides	230	11
clavatula	230	12
granosa	230	16 & 17
indentata	230	10
littoriniformis	230	18
mitriformis	230	14
Tritonis	230	15
uniplicata	230	13
Capsa Brasiliensis	61	1

	Pl.	Fig.
Capsa complanata	61	2
Cardita calyculatus	79	1 & 2
imbricatus	79	4
sulcatus	79	3
Cardium aspersum	75	15
australe	75	12
biangulatum	73	2
cardissa	73	1
consors	74	8
Cumingii	74	5
elatum	73	3
graniferum	76	17
impolitum	74	6
maculatum	76	18
multipunctatum	75	14
obovale	73	4
orbita	75	13
oxygonum	74	9
Panamense	76	21
paucicostatum	76	20
planicostatum	77	25
procerum	77	23
punctulatum	74	7
ringiculum	75	11
senticosum	74	10
striatulum	76	16
subretusum	77	24
tenuicostatum	76	19
tumoriferum	77	22
Carinaria gracilis	158	3 to 5
Mediterranea	158	1 & 2
Carocolla Dryope	168	10
fibula	167	5
Gualteriana	167	6
labyrinthus	167	3
Listeri	168	11 & 12
marginata	167	8
Carocolla parmula	167	7
reginæ	167	2
rota	167	1 & 4
Siquijorensis	168	15
Thersites	168	9
virgo	168	13
Zebuensis	168	14 & 16
Cassidaria echinophora	252	1
Tyrrhena	252	2 & 3
Cassis flammea	255	2
glauca	255	1
Catophragmus imbricatus	4	1 to 6
Cerithium breviculum	226	1
columna	227	7
decollatum	227	2
muricatum	227	10
mutatum	227	6
Pacificum	226	9
Soverbii	226	8
sulcatum	227	3
tuberculatum	226	4
varicosum	226	5
Chama arcinella	96	2
damæcornis	96	1
Lazarus	96	3
squamosa	96	4
Chilina ampullacea	189	3
fluctuosa	189	2
fluminea	189	7
fluviatilis	189	5
gibbosa	189	4
ovalis	189	6
robustior	189	1
Chiton amiculatus	132–3	80
Barnesii	131	2
Blainvillii	131	6
Chilensis	134	154

	Pl.	Fig.
Chiton cymbiola	133	85 & 86
fulvus	132	83
Grayi	131	8
Hennahii	131	1
Lyelli	131	7
marmoratus	134	148
piceus	134	147
setiger	131	4
spinosus	134	151
striatus	131	3
Swainsoni	131	5
tunicatus	134	152
Watsoni	132	81 & 82
Chitonellus fasciatus	135	3 to 5
lævis	135	2
striatus	135	1
strigatus	135	6
Cinaras vittatus	15	1 to 4
Clausilia labiata	171	3
Macascarensis	171	1
torticollis	171	2
Clavagella aperta	18	1 to 4
echinata	18	5
Cleidothærus chamoides	40	1 to 4
Cleodora cuspidata	295	2
Clitea lævigata	8	1 & 3
verruca	8	2
Columbella concinna	258	8
dorsata	257	7
elegans	257	5
hæmastoma	257	4
harpæformis	257	3
labiosa	258	2
lyrata	257	1
mendicaria	258	4
mercatoria	258	9
nitida	258	7
Columbella Philippinarum	257	9
pulcherrima	257	2
punctata	258	5
recurva	257	8
rustica	258	3
semipunctata	257	6
strombiformis	258	1
Terpsichore	258	6
Concholepas Peruviana	262	1 & 2
Conia Lyonsii	6	4 & 5
porosa	6	1 to 3
Conus Barbadensis	292	105
centurio	292	103
colubrinus	292	106
fuscatus	294	130 & 131
imperialis	294	129
monile	293	118 & 119
mustelinus	294	136
nobilis	293	116 & 117
Omaicus	293	115
Sumatrensis	292	104
viridulus	294	132
Corbis fimbriata	57	1 to 3
Soverbii	57	4 to 6
Corbula Gallica	36	2 & 3
nucleus	36	1
Coronula balænaris	2	2
diadema	2	1
testudinaria	2	3
Crania antiqua	128	7
costata	128	6
nummulus	128	4 & 5
Parisiensis	128	3
personata	128	1 & 2
Crassatella gibbosa	44	2
Kingicola	44	3
radiata	44	1

	Pl.	Fig.
Crenatula avicularis	105	1 & 3
mytiloides	105	2
Crepidula aculeata	143	4
costata	143	3
dilatata	143	5
fornicata	143	1
onyx	143	2
porcellana	143	7
unguiformis	143	6
Creseis spinifera	295	4
Creusia gregaria	9	1 to 6
Cucullæa auriculifera	81	1 to 3
decussata	81	4
Cumingia coarctata	49	4
lamellosa	49	3
mutica	49	1
trigonularis	49	2
Cuvieria columnella	295	6
Cyclas rivicola	62	1 to 3
Cyclostoma acutimarginatum	183	7
ambiguum	183	8
cariniferum	185	23
Cumingii	185	19
Cuvierianum	184 & 185	11 & 24
evolutum	185	18
filosum	184	16
fimbriatulum	183	5
fulvifrons	185	20
giganteum	184	17
goniostoma	183	3
Harveianum	184	13
nitidum	183	2
obsoletum	183	4
oculus capri	184	11
Petiverianum	184	15
pulchrum	184	12
Cyclostoma pyrostoma	183	9
semilabrum	183	1
Stainforthii	183	6
tigrinum	183	10
vittatum	185	22
volvulus	185	21
Cymba Neptuni	284	1
Cymbulia Peronii	296	1 to 3
Cypræa achatidea	289	179
aurora	286	141
cervina	287 & 288	175
Cumingii	289	181
guttata	288	176
leucodon	287 & 289	176 & 8
ovulata	286	145
pediculus	286	148
radians	286	146
rosea	286	147
subviridis	289	180
Cypricardia oblonga	80	1 & 2
Cyprina vulgaris	65	1 & 2
Cyrena Sumatrensis	63	1 to 3
Cytherea aurantiaca	69	3
castrensis	71	2
concentrica	70	4
dione	71	1
erycina	71	3
gibbia	70	5
Meroë	70	6
petechialis	69 & 70	1
planulata	69	2

D.

	Pl.	Fig.
Dentalium aprinum	130	7
dentalis	130	4
elephantinum	130	5
entalis	130	3

	Pl.	Fig.
Dentalium inversum	130	1
longitrorsum	130	6
octogonum	130	8
translucidum	130	2
Dolabella Rumphii	157	1 & 2
Donax cuneata	60	2
deltoides	60	4
scortum	60	1
trunculus	60	3

E.

	Pl.	Fig.
Elmineus Leachii	3	1 & 2
Erato angistoma	285	1
guttula	285	8 & 9
lachryma	285	5 & 6
lævis	285	3
Maugeriæ	285	4
scabriuscula	285	7 & 10
sulcifera	285	2
Etheria semilunata	95	1 & 2
Eulima imbricata	209	4
labiosa	209	2
major	209	1
polita	209	5
pusilla	209	6
subangulata	209	3

F.

	Pl.	Fig.
Fasciolaria princeps	231	1
Fissurella Barbadensis	141	5 & 6
Cayenensis	141	7
crassa	142	9 & 11
fascicularis	142	14
Græca	141	3
hiantula	142	10
Javaniensis	142	12
nimbosa	141	2
Fissurella nodosa	141	1
picta	141	4
rosea	142	8
viridula	142	13
Fistulana clava	19	1 to 5
Fusus colosseus	232	3
lanceola	232	2
Nifat	232	5
striatus	232	4
turricula	232	1

G.

	Pl.	Fig.
Galathæa radiata	64	1 & 2
Galeomma Mauritiana	54	4 & 5
Turtoni	54	1 to 3
Gastrochæna cuneiformis	26	3 to 5
modiolina	29	1 & 2
Glauconome Chinensis	31	1 & 2
Glycimeris siliqua	28	1 & 2
Gnathodon cuneatus	43	1 to 4

H.

	Pl.	Fig.
Haliotis asinina	150	2
excavata	150	1
parva	150	3
Harpa imperialis	263	1
mutica	263	2
Helicina acutissima	186	2
adspersa	186	3 & 4
agglutinans	186	11 & 12
Antillarum	186	15
aurantia	186	16
major	186	7
polita	186	9
pulchella	186	13
pulcherrima	186	6
rhodostoma	186	5
sagra	186	14

	Pl.	Fig.
Helicina Tankervillii	186	10
variabilis	186	1
viridis	186	8
Helix Busbii	164	11
cepoides	164	14
chrysocheilus	163	1
coccomelos	164	9
columbaria	163	5
decipiens	163 & 165	3 & 16
Falconari	163	4
florida	163	1
Harfordii	165	15
intorta	164	10
latitans	165	18
Luzonica	165	20
meretrix	163	6
Mindana	164	8
Pan	165	9
pulcherrima	164	12 & 13
sarcinosa	163	7
zonifera	165	17
Hipponyx cornucopia	145	1 to 9
lævis	145	10 to 16
Hippopus avicularis	98	2
maculatus	98	1
Hyalæa tridentata	295	1
Hyria corrugata	90	2
syrmatophora	90	1

I.

Ianthina exigua	205	2 & 3
fragilis	205	1
Iridina elongata	92	1 & 2
ovata	93	1 & 2
Isocardia Basochiana	78	3
cor	78	1
Moltkiana	78	2

L.

	Pl.	Fig.
Leptoconchus striatus	267	1 to 5
Lima bullata	92	3
glacialis	92	3
Loscombii	92	4
squamosa	92	2
Limacina helicialis	295	3
Limax antiquorum	160	1 to 3
Lingula anatina	125	3
Audebardii	125	1
semen	125	2
tumidula	125	4
Lithodomus caudigerus	99	3 & 4
dactylus	99	1 & 2
Lithotrya dorsalis	11	1 to 3
Littorina filosa	222	5
obesa	222	6
pulchra	222	2 & 3
varia	222	4
vulgaris	222	1
Lottia Antillarum	137	4
gigantea	137	1
radians	137	3
testudinaria	137	2
Lucina Childreni	59	2
Jamaicensis	59	3
punctata	59	1
Lutraria papyracea	41	2
solenoides	41	1
Lymnæa castanea	192	7
elongata	191	6
fontinalis	192	8
fusiformis	191	3
glutinosa	191	5
ovalis	191	4
rivalis	192	9
rufescens	191	2

	Pl.	Fig.
Lymnæa stagnalis	191	1
turrita	192	10
M.		
Mactra solida	42	3
Spengleri	42	1
turgida	42	2
Magilus antiquus	266	2 & 3
Malleus normalis	107	2
vulgaris	107	1
Marginella Cleryi	277	1
elegans	277	5 & 6
glabella	278	1
Goodalli	277	8 & 9
labiata	277	7
nubeculata	277	4
persicula	278	2
splendens	277	2 & 3
Melania amarula	194	1
costellata	194	4
marginata	194	5
subulata	194	3
variabilis	194	2
Melanopsis acicularis	195	4
atra	195	1
buccinoides	195	2
costata	195	3
fusiformis	195	5
Melo diadema	283	1
Mesodesma arctatum	45	3
Chemnitzii	45	1
donacia	45	4
donacilla	45	5
glabratum	45	6
striatum	45	2
Mitra adusta	280	3
cardinalis	279	2
Mitra dactylus	280	7
episcopalis	279	1
fissurata	280	5
marmorata	280	8
olivaria	280	6
regina	280	4
Modiola discors	100	4
discrepans	100	3
picta	100	1
plicatula	101	7
semifusca	101	6
silicula	100	2
tulipa	101	5
Monoceros breve	261	2
cingulatum	261	4
imbricatum	261	1
lugubre	261	3
Murex Belcheri	240	5 & 6
clavus	238	106
coronatus	240	3 & 4
Cumingii	240	1 & 2
ferrugo	237	53
microphyllus	238	105
pinniger	238	109
pinnuliferus	240	10 & 11
rarispina	237	52
rosarium	239	118
rota	239	119
Soverbii	240	7 to 9
torrefactus	239	120 & 121
trigonularis	238	107
tripterus	237	54
varius	238	108
Mya arenaria	33	1 & 2
Mycetopus soleniformis	94	1 & 2
Myochama anomioides	39	1 to 4
Mytilus achatinus	102	1

	Pl.	Fig.
Mytilus crenatus	102	2
polymorphus	102	3
N.		
Nassa abbreviata	269	6
arcularia	269	1
clathrata	269	4
neritea	269	3
papillosa	269	5
Thersites	269	2
Natica canrena	204	1
cepacea	204	3
mamilla	204	2
Nautilus Pompilius	299	1
Nerita chlorostoma	202	3
crenulata	202	5
ornata	202	4
peloronta	202	1 & 2
tricarinata	202	6
Neritopsis cancellata	203	1
granosa	203	3
granulata	203	2
Nodosaria Berthelotiana	297	15
carinata	297	14
striati-collis	297	13
Webbiana	297	16
Nucula costellata	85	8
crenifera	84	3
cuneata	85	15
curvirostra	85	5
eburnea	85	10
Elenensis	85	14
elongata	84	2
fabula	85	13
gibbosa	85	9
lanceolata	84	1
Mauritiana	85	17
Nucula nasuta	85	12
Nicobarica	85	4
parva	85	7
pella	85	6
polita	85	11
striata	85	16
O.		
Octomeris angulosa	5	1 to 11
Oliva clavula	273	4
maura	273	2
porphyria	273	1
subulata	273	3
Oniscia cancellata	254	1 to 3
cithara	254	5
Dennisoni	253	5 & 6
oniscus	254	4
strombiformis	253	1
tuberculosa	253	2
Orbicula lævis	129	1 & 2
Norvegica	129	3 to 5
Orbiculina depressa	297	3
numismalis	297	2
universa	297	1
Ostrea carinata	121	1
crista-galli	121	2
edulis	120	1
folium	121	3
virginica	120	2
Otion Cuvierii	16	1 to 4
Ovula birostris	290	5
gibbosa	290	4
verrucosa	290	2 & 3
volva	290	1
P.		
Paludina achatina	197	1

	Pl.	Fig.
Paludina olivacea	197	3
ponderosa	197	2
unicarinata	197	4
Pandora flexuosa	37	4 & 5
rostrata	37	1 to 3
Panopæa Aldrovandi	27	1
australis	27	2
Parmacella calyculata	159	1 to 3
Parmophorus australis	139	2 & 3
corrugatus	139	1
granulatus	139	4
intermedius	139	5 & 6
Partula auriculata	175	7 & 8
faba	175	13 & 14
gibba	175	3 & 4
hyalina	175	1 & 2
inflata	175	11 & 12
Otaheitana	175	15 & 16
rosea	175	9 & 10
varia	175	5 & 6
Patella cochlear	136	5
longicosta	136	6
miniata	136	4
pellucida	136	2
stellæformis	136	3
variegata	136	1
Pecten asper	114	6
aurantiacus	114	5
bifrons	114*	8
exoticus	114*	5
fuscus	113	2
histrionicus	114*	1
imbricatus	114*	2
pallium	113	4
pes-felis	114*	4
pleuronectes	113	3
pusio	114	6
Pecten rastellum?	114*	3
sauciatus?	114*	7
superbus	114*	9
turgidus	113	1
Pectunculus pilosus	83	1
pulvinatus	83	2
Pedum spondyloideum	111	1 to 5
Pentelasmis anatifera	12	1 & 2
Perna ephippium	106	2
isognomum	106	1
Petricola dactylus	51	3
ochroleuca	51	4
pholadiformis	51	1 & 2
rupestris	51	5
subglobosa	51	6
Phasianella pullus	223	3
varia	223	1 & 2
Pholadomya candida	32	1 to 4
Pholus costata	23	1 & 2
dactylus	24	1
papyracea	24	3
striata	24	2
Phorus calculiferus	215	7
corrugatus	214	5
exutus	215	9 & 10
Indicus	215	6
onustus	214, 5	3 & 8
pallidulus	214	4
solaris	214	1 & 2
Pileopsis ungarica	146	1 & 2
Pinna nigrina	104	1
serrata	103	1
Placuna placenta	122	1 & 2
Placunanomia Cumingii	123	1 & 2
Planaxis mollis	270	2
semisulcatus	270	3
sulcatus	270	1

	Pl.	Fig.
Planorbis bicarinatus	190	4
carinatus	190	3
corneus	190	1
euomphalus	190	5
Guadaloupensis	190	2
Pleurobranchus membranaceus	154	1 & 2
Pleurotoma albicostata	234	13
Beckii	234	11
bicolor	234	12
cryptorrhaphe	234	16
diadema	234	18 & 20
discors	234	14
echinata	234	19
lineata	234	15
maculosa	233	8
maura	233	4
muricata	235	3
nodifera	235	1
obesa	235	5
oxytropis	233	2
pyramidata	233	1
regia	233	7
rosea	233	3
speciosa	233	4
spirata	234	17
stromboides	235	4
turricula	233	6
unimaculata	233	9
zonulata	234	10
Plicatula gibbosa	115	1 & 2
spinosa	115	3
Pollicipes cornucopia	14	1
mitella	14	2
villosus	14	3
Polystomella Canariensis	297	7
complanata	297	9
Polystomella vulgaris	297	8
Psammobia cærulescens	53	3
rugosa	53	1
violacea	53	2
Pterocera elongata	248	2
multipes	248	1
rugosa	247	1
Pullastra literata	72	2
papilionacea	72	3
vulgaris	72	1
Pupa fusus	170	5
gracilis	170	8
Maugeri	170	6
mumia	170	2
pagodus	170	1
polyodon	170	9
sulcata	170	3 & 4
truncatula	170	7
Pupina humilis	181	7 & 8
lubrica	181	9 & 10
Nunezii	181	5 & 6
similis	181	3 & 4
vitrea	181	1 & 2
Purpura armigera	260	11
echinulata	259	4
Francolinus	259	3
fucus	260	7
madreporarum	260	12
melo	259	5
neritoidea	260	8
patula	259	1
planospirata	260	6
succincta	259	2
tessellata	260	10
Pyramidella cincta	207	2 & 4
dolabrata	207	9 & 10
glans	207	1

	Pl.	Fig.
Pyramidella maculosa	207	3 & 7
plicata	207	5 & 6
ventricosa	207	8
Pyrgoma Anglicum	10	7
crenatum	10	1 to 6
Pyrula Mawæ	236	1 & 2
papyracea	236	4
perversa	236	5
rapa	236	3
R.		
Ranella cœlata	241	8
cruentata	241	5
elegans	242	17
nana	241	6
rugosa	241	7
subgranosa	242	18
ventricosa	242	16
Ricinula arachnoides	256	5
digitata	256	3 & 4
horrida	256	1
morus	256	2
Rissoa acicula	208	4
deformis	208	2
spirata	208	3
reticulata	208	1
Rostellaria occidentalis	246	3
pes-Pelicani	246	5
Povisii	246	1 & 2
rectirostris	246	4
Rotella monilifera	216	1
vestiaria	216	2
S.		
Sanguinolaria diphos	52	3 & 4
rosea	52	1 & 2
Saxicava rugosa	50	1 to 4
Scalaria australis	210	4
clathrus	210	2
foliacea	210	5
pretiosa	210	1
raricosta	210	3
Scalpellum vulgare	13	1 & 2
Scarabus castaneus	188	10
clausus	188	1
imbrium	188	11
lekithostoma	188	6
Lessoni	188	5 & 8
Petiverianus	188	7
plicatus	188	3
pyramidatus	188	12
striatus	188	9
trigonus	188	2
undatus	188	4
Sigaretus canaliculatus	248	4
concavus	248	1
haliotoideus	248	2
Leachii	248	3
Siliquaria anguina	151	1 to 3
Siphonaria atra	138	1
characteristica	138	3
denticulata	138	2
gigas	138	6
obliquata	138	4 & 5
Solarium perspectivum	213	1 to 5
Solecurtus acutidens	26	2
Dombeii	26	1
strigillatus	26	3 & 4
Solemya Mediterranea	29	1 & 2
parvula	29	3
Solen truncatus	25	1
vagina	25	2
Solenella Norrisii	30	1 to 4
Spiroloculina Berthelotiana	297	6

	Pl.	Fig.
Spiroloculina cymbium	297	4
Webbiana	297	5
Spirula Peronii	298	1 to 3
Spondylus Americanus	116	1
aurantius	118	6 & 7
ducalis	117	4
gædaropus	117	3
nudus	119	10
podopsideus	117	5
princeps	116	2
regius	119	8
spathuliferus	119	9
Stomatia auricula	149	5
duplicata	149	3
imbricata	149	1
phymotis	149	4
planulata	149	6
sulcifera	149	2
Strombus auris Dianæ	251	4
decussatus	251	8
dentatus	251	6
fissurella	251	7
Novæ Zelandiæ	250	2
Peruvianus	250	3
Thersites	249	1
variabilis	251	5
Struthiolaria crenulata	245	3 & 4
straminea	245	1 & 2
Stylifer astericola	225	4 to 12
subulatus	225	1 to 3
Succinea amphibia	180	3
cucullata	180	1
obtusa	180	2

T.

	Pl.	Fig.
Tellina opercularis	55	1
radiata	55	3
Tellina rosea	56	1
scobinata	55	2
Timorensis	56	2
Terebellum convolutum	291	4
fusiforme	291	3
subulatum	291	1 & 2
Terebra ornata	274	1
pretiosa	274	2
strigata	274	3
subulata	275	1
Terebratula caput serpentis	126	2
dorsata	126	3
psittacea	126	5
rosea	126	4
sanguinea	126	1
Teredo navalis	21	1 to 4
Testacellus haliotoideus	161	1 & 2
Maugei	161	7 to 10
scutulum	161	3 to 6
Textularia bulloides	297	11
capreolus	297	12
sagittula	297	10
Thecidium digitatum	127	3
Mediterraneum	127	6 & 7
pumilum	127	1 & 2
recurvirostre	127	4 & 5
Thracia corbuloides	35	3
phaseolina	35	1
plicata	35	2
Trichotropis bicarinata	265	1 & 2
unicarinata	265	3
Tridacna elongata	97	1
Trigonia costata	86	3
margaritacea	86	1 & 2
Triton anus	244	2
australis	243	1
clandestinus	243	2

	Pl.	Fig.
Triton clavator	243	3
cutaceus	244	3
lotorium	244	1
Trochus annulatus	218	10
asteriscus	217	3
calcar	217	2
cariniferus	218	8
eximius	218	12
gemmosus	218	9
Guildfordiæ	218	17
Hanleyanus	218	11
Javanicus	218	15
melanostoma	218	16
modestus	218	14
olivaceus	217	7
ornatus	218	13
pileolum	217	5
triserialis	217	1
undosus	217	4
unguis	217	6
Truncatella Caribæensis	182	7
clathrus	182	3
Montagui	182	1
scalariformis	182	6
striata	182	4
truncatula	182	5
ventricosa	182	2
Tubicinella balænarum	1	1 to 3
Turbinellus acuminatus	229	2
armatus	229	6 & 7
capitellum	229	5
imperialis	229	4
pyrum	228	1 to 3
rigidus	229	3
vexillulum	229	1
Turbo coronatus	220	9
crassus	220	10
Turbo Moltkianus	220	8
petholatus	219	4
pulcher	219	3
rubicundus	220	11 & 12
Spenglerianus	219	5
squamiger	220	7
Ticaonicus	219	6
variabilis	219	1 & 2
Turritella duplicata	224	1
exoleta	224	3
sinuosa	224	4
sulcata	224	2
U.		
Umbrella Indica	155	1 & 2
Ungulina transversa	46	1 to 3
Unio alatus	89	8
ambiguus	87	2
cariosus	89	10
clavus	88	3
Grayanus	88	4
naviformis	89	7
ovalis	87	1
retusus	88	6
triangularis	89	9
tuberculatus	88	5
V.		
Valvata carinata	196	2
piscinalis	196	1
Velutina lævigata	147	1 & 2
zonata	147	3 & 4
Venus cancellata	68	2
gnidia	68	5
lamellata	68	3
paphia	68	1
plicata	68	6

	Pl.	Fig.
Venus puerpera	67	1
subrostrata	68	4
subrugosa	67	2
tiara	67	3
Vermetus eburneus	152	2
lumbricalis	152	1
Vitrina Cuvierii	162	2
pellucida	162	1
Voluta aulica	282	1
cymbiola	282	1
Voluta papillaris	281	1
rutila	282	3
volvacea	282	2
Volvaria acutiuscula	276	3
bulloides	276	1
concinna	276	2
Vulsella lingulata	108	1 to 4
X.		
Xylophaga dorsalis	22	1 to 4

THE END.

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INDEX TO THE SPECIES

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D.

	Pl.	Fig.
Delphinula aculeata	212	8
atrata	212	12
distorta	211	3
formosa	212	9
incisa	212	11
laciniata	211 & 212	5 & 7
melanacantha	211 & 212	4 & 10
nodosa	211	2
Tyria	211	1 & 6
Dolium fimbriatum	264	2
olearium	264	1

E.

Eburna Japonica	271	1
lutosa	271	5
papillaris	271	2
spirata	271	3
Valentiana	271	4
Emarginula cancellata	140	2
conoidea	140	7
emarginata	140	4
fissurata	140	8
notata	140	3
Panhiensis	140	1
tricostata	140	5 & 6

M.

Margarita sulcata	221	1
striata	221	3
tæniata	221	2
undulata	221	4

N.

	Pl.	Fig.
Navicella atra	199	4
depressa	199	10
lineata	199	2 & 3
Luzonica	199	9
porcellana	199	5 & 8
radiata	199	7
Recluzii	199	6
suborbicularis	199	12
tessellata	199	1
Neritina canalis	201	22
corona	201	20
Lamarckii	200	17
latissima	200	16
meleagris	201	19
Oweniana	200	15
piperina	200	18
punctulata	201	21
semi-conica	201	23
subgranosa	200	14

T.

Tornatella coccinata	206	10
fasciata	206	11
flammea	206	1, 4 & 6
glabra	206	12
insculpta	206	2
nitidula	206	5
solidula	206	7
tessellata	206	3
virgata	206	8 & 9

V.

Vaginula Daudinii	295	5

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